MICRO-TEMP® LT

Operation and Technical Manual

Model 749 Localized Therapy Units

Cincinnati Sub-Zero

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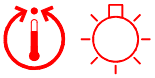
MICRO-TEMP LT Symbols / Definitions

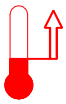
Attention: Read Operation Instructions and Manual Before Operating

Temperature Set

Water Temperature



Temperature Set Point Indicator



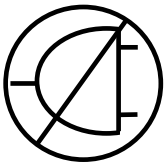
Increasing Temperature

Decreasing Temperature

O / I

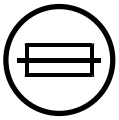
OFF / ON Switch

Low Water Level



Power Failure

CAUTION



Fuse

~

AC Voltage

Disconnect Power Before Servicing

Danger; Risk of Electric Shock

Risk of Explosion: Do not use in the Presence of Flammable Anesthetics

Separate collection for electrical and electronic equipment

Type B Equipment

Earth (Ground)

Equipotentiality

ESD Susceptibility

Cincinnati Sub-Zero Products, Inc., reserves the right to make equipment changes and improvements, which may not be reflected in this manual.

WARNING

- Read Operation Manual before operating.

- **A physician's order is required for setting pad temperature and use of equipment.** As directed by physician, check patient's temperature and skin condition of areas in contact with pad. Check the pad water temperature. Pediatric patients, temperature-sensitive patients with vascular disease, surgical patients, diabetics, and Raynauds disease patients should be checked more frequently. **Notify the physician promptly of any change in patient status in order to avoid serious injury or death. Failure to inform the physician of any deviation may result in injury to the patient.**

  Pediatrics – Infants and children's body temperature are more responsive to surface heating than adults. Due to their size, the effect of heating a child is more pronounced because of their higher ratio of skin contact area to body mass.

  Temperature Sensitive Patients – Patients with impaired peripheral blood circulation and patients who are incapacitated may be more sensitive to temperature changes than patients with normal circulation.

  Surgical Patients – Patients with poor circulation due to inadequate heart function, loss of blood, or impaired peripheral blood circulation may be more sensitive to temperature changes.

- **If device is used at home, patient must follow directions prescribed by their physician** and be aware of all warnings and cautions mentioned throughout the manual.

- **Observe patient's skin condition frequently due to individual differences in sensitivity and susceptibility to injury from heat and/or externally applied chemicals or pressure. Patients at greatest risk are those unconscious, on prolonged therapy, diabetics, children, and persons incapacitated, with sensitive skin areas, or poor circulation.**

- **Do not use for ECMO (Extracorporeal Membrane Oxygenation) therapy.**

- **Heating may affect toxicity of certain prep solutions which has been reported to cause skin injury when remaining on patient's skin during application of prolonged heat. For moist heat therapy, moisten the pad using distilled water only.**

- The method of temperature control provided by all localized heat therapy units presents the danger of heating body tissues, particularly the skin, to a point where they are injured, i.e., burns. Depending on the extent and severity of a burn, very serious complications may arise.

- Prevent excessive and/or prolonged tissue pressure and shearing forces, especially over bony prominences, to prevent skin damage that may result.

- **Do not wrap pad so tightly as to constrict blood flow. Do not use pins to secure pad or hoses. Do not allow pad or hoses to come in contact with any sharp object.**

- Do not place additional heat sources between the patient and pad. **Skin damage may result.**

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WARNING
• **Proper sanitation procedures must be practiced and hygienic safety must be maintained, to prevent contamination.** Contamination can affect patient's health, i.e. skin irritation/rash may result.
• Any time water is found leaking into or around the unit, connecting hose, and/or pad, turn the unit off, disconnect the power cord from its power source, and correct the problem before proceeding. **Water leaks could lead to electric shock.**
• **Water leaks present a risk of infection** and should be handled accordingly. Proper sanitation procedures should be followed including, but not limited to, the preventative maintenance described in this manual. **Leaky pads or hoses, as well as unapproved pads should never be used.**
• Do not use the MICRO-TEMP LT system in the presence of flammable anesthetics. **Risk of explosion can result.**
• **For continued protection against risk of fire, replace only with same type and rating of fuse.**
• This device is still energized when the inlet switch is in the off position. To completely disconnect the device from the power source, remove the appliance plug from the back of the unit.
• Always **unplug the unit** before accessing internal components during service. Failure to unplug the unit could result in **electric shock.**
• Do not by-pass ground on power cord plug. **Electrical Hazards may result.**
• Do not position unit near any objects that can generate a strong electrical/magnetic field. **Potential electromagnetic interference may result.** If interference is observed, re-locate the unit away from such devices.
• The display may blank momentarily during an electrostatic discharge event, but the essential performance of the unit is not affected and no harm will occur to the patient. If an electrostatic discharge event occurs, check to see if unit is operating properly. If unit does not return to previous operation, turn unit off then back on and reset temperature settings as prescribed.
• Keep air vents free of debris and obstruction. **Blockage of vents could result in the unit overheating which could render the unit unable to provide adequate therapy and excessive surface temperatures could cause injury of patient or operator. Keep unit, specifically the air vents, away from curtains or other obstructions.**
• Remove the MICRO-TEMP LT from service if the outer casing or membrane control panel is cracked or internal components are exposed. **Contact with internal components could result in electric shock or thermal injury to the patient or operator and exposure to sharp edges.**
• **Before** returning the MICRO-TEMP LT to patient use **after** repairs, the MAINTENANCE CHECKLIST in Section 4 must **always** be performed. **Improper repair and inadequate maintenance can result in system damage and patient injury.**
• The repair, calibration, and servicing of the MICRO-TEMP LT should be performed by qualified Medical Equipment Service Technicians, Certified Biomedical Electronics Technicians, or Certified Clinical Engineers familiar with good repair practices for servicing medical devices, and in accordance with instructions contained in this manual. **Improper repair can result in system damage and patient injury.**

CAUTION
• Always drain the MICRO-TEMP LT to a sanitary drain because **bio-contaminants** may be present in the unit's water supply.
• **Do NOT fill the reservoir to the bottom of the strainer if there is water in the pad.** This could cause an overflow when the unit is turned on.
• Working with electronic boards, plugs, and cables requires delicate handling. Proper **Electrostatic Discharge procedure should be followed during replacement of any electronic board.**
• **Use only CSZ provided hospital grade power cord assembly and used in conjunction with a properly grounded receptacle** or electric shock may result.
• Do not operate pump without a pad connected or with pad clamps in the "CLOSED" position. Always check clamps to make sure they are fully open.
• Full or partial covering of pads with materials with high insulative properties (pillows, etc.) could cause excessive retention of heat in the patient leading to injury.
• The pad surface should be checked for freedom from mechanical damage prior to each application.
• Complete folding of pad may restrict flow and reduce therapy to patient.
• Make sure hose and pads are free of kinks that might restrict flow.
• Check hose couplings to be certain they are properly locked together.
• Follow pad instructions and Hospital/Physician instructions for applying, storing, and disposal of product.
• **Do not** use alcohol. Alcohol may cause pad and unit deterioration.
• **Use distilled water only. Do Not Use De-Ionized water or tap water.** Failure to use distilled water may result in **poor performance and damage to the Micro-Temp LT.**
• It is recommended that two (2) ounces of Propylene Glycol be added to the reservoir upon fill up.

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BEFORE YOU CALL FOR SERVICE

To help us better serve you, please have the serial number of your MICRO-TEMP LT unit ready when you call for parts or service.

IN-WARRANTY REPAIR AND PARTS

All parts on your MICRO-TEMP LT unit are covered by a one year warranty (parts and labor if returned to CSZ). To return defective parts or units, first obtain a Returned Materials Authorization (RMA) number from our Medical Technical Service department.

RECEIVING INSPECTION

After unpacking the MICRO-TEMP LT System, be sure to inspect the system for concealed damage. Retain all packing material and carefully describe or photograph any damage. Notify the carrier at once and ask for an inspection (in writing). Failure to do this within 15 days may result in loss of claim. Do not return the equipment to Cincinnati Sub-Zero. Call our Medical Technical Service department for further instructions.

IMPORTANT SAFETY INFORMATION

Refer to this manual for instructions and caregiver information. Read and understand all precautionary information before using, prescribing, or servicing the MICRO-TEMP LT unit.

SECTION 1. INTRODUCTION

1-0. GENERAL SAFETY PRECAUTIONS

To provide the patient maximum safety during the use of the MICRO-TEMP LT localized heat therapy system, a thorough knowledge and understanding of the system and its correct application and operating use are required. Each person who is responsible for use or direction of use of the system, such as physicians, nurses, technicians and operators must read and understand this operating manual and all precautions and warnings prior to use. It is recommended this manual be reviewed at least semi-annually as a refresher to ensure safe operation and application. For proper knowledge and understanding, health care facility in-service is available upon request.

1-1. GENERAL DESCRIPTION OF THIS MANUAL

This manual describes the operation, maintenance, and service of the CSZ MICRO-TEMP LT localized heat therapy system. Section One describes the physical and functional characteristics of the MICRO-TEMP LT System. Section Two explains how to prepare the MICRO-TEMP LT unit for general use. Section Three expresses how to operate the unit. Section Four describes the regular maintenance of the MICRO-TEMP LT unit. Section Five explains Field Repair and Service of the MICRO-TEMP LT unit and contains a troubleshooting guide. Section Six outlines parts information, and Section Seven lists the specifications of the MICRO-TEMP LT.

All individuals who use, operate, or service the unit should be familiar with all parts of this manual. However, Sections One and Two are primarily intended for personnel who unpack and setup the unit. Section three is primarily intended for personnel who operate the unit, and Sections Four through Six are primarily intended for personnel who service and repair the unit. Section (1-4) describes the external features of the MICRO-TEMP LT and Section (3-5) describes the alarm messages.

1-2. GENERAL DESCRIPTION OF THE MICRO-TEMP LT SYSTEM

The CSZ MICRO-TEMP LT (Model 749) Localized Heat Therapy System is used to raise a patient's body part temperature and/or maintain a desired patient body part temperature through conductive heat transfer. The CSZ MICRO-TEMP LT unit is intended for continuous operation and is composed of a heater, a circulating pump, and a microprocessor. This unit requires no field adjustments or calibrations in order to maintain the precise board measurement of temperature and temperature limits.

Distilled water is heated and pumped from the unit to a thermal pad. The pad[1] rests under, on top of, or wrapped around the desired area on the patient (i.e. leg, arm, etc.) and is designed so that the water circulates through the pad and returns to the unit.

[1] The recommended pad(s) for use are described in Section 1-5.

The Micro-Temp LT is intended for use in ambient temperatures of 20℃ – 35℃ (68℉ – 95℉). The maximum contact surface temperature at the pad is 42℃ (107℉).

1-3. CLINICAL APPLICATIONS

The MICRO-TEMP LT unit is used primarily in hospitals, in home environments (if prescribed by a doctor), and in veterinarian offices.

Medically this system can be used to increase the rate of circulation, and treat skin trauma (i.e. bruises, contusions, abscesses, boils, and burns), inflammation and other medical problems like infection, phlebitis, I.V. infiltration, and neuritis. It can also be used in orthopedic conditions to treat lower back pain, strains, acute injuries, chronic pain, muscle spasm, tendonitis and arthritis.

1-4. PHYSICAL DESCRIPTION OF THE MICRO-TEMP LT UNIT

See Section (7) for specifications and certifications of the MICRO-TEMP LT.

1-4.1. EXTERNAL FEATURES - FRONT VIEW

The external features in Figure (1-1) of the MICRO-TEMP LT unit are described as follows:

A. The membrane on the front of the unit allows the user to change the temperature of the water flowing through the thermal pad. It displays error messages and sounds an alarm if there is a problem with the device. Refer to Section (1-4.3) for a list of controls on the membrane. Refer to Section (3-5) for a list of possible display messages and alarms.

B. The air vents, on both the top and bottom of the unit, provide air circulation for the control board.

C. The built in handle permits the operator to grip and pick up the unit when moving it.

D. The sight window allows the operator to visually see how much water is in the reservoir.

E. The permanently attached hose connects the unit and the thermal pad.

F. The four rubber suction cups on the bottom of the unit prevent the unit from tipping.

G. The coupling attached to the end of the twin black tubing allows a quick disconnect for the heat therapy pad.

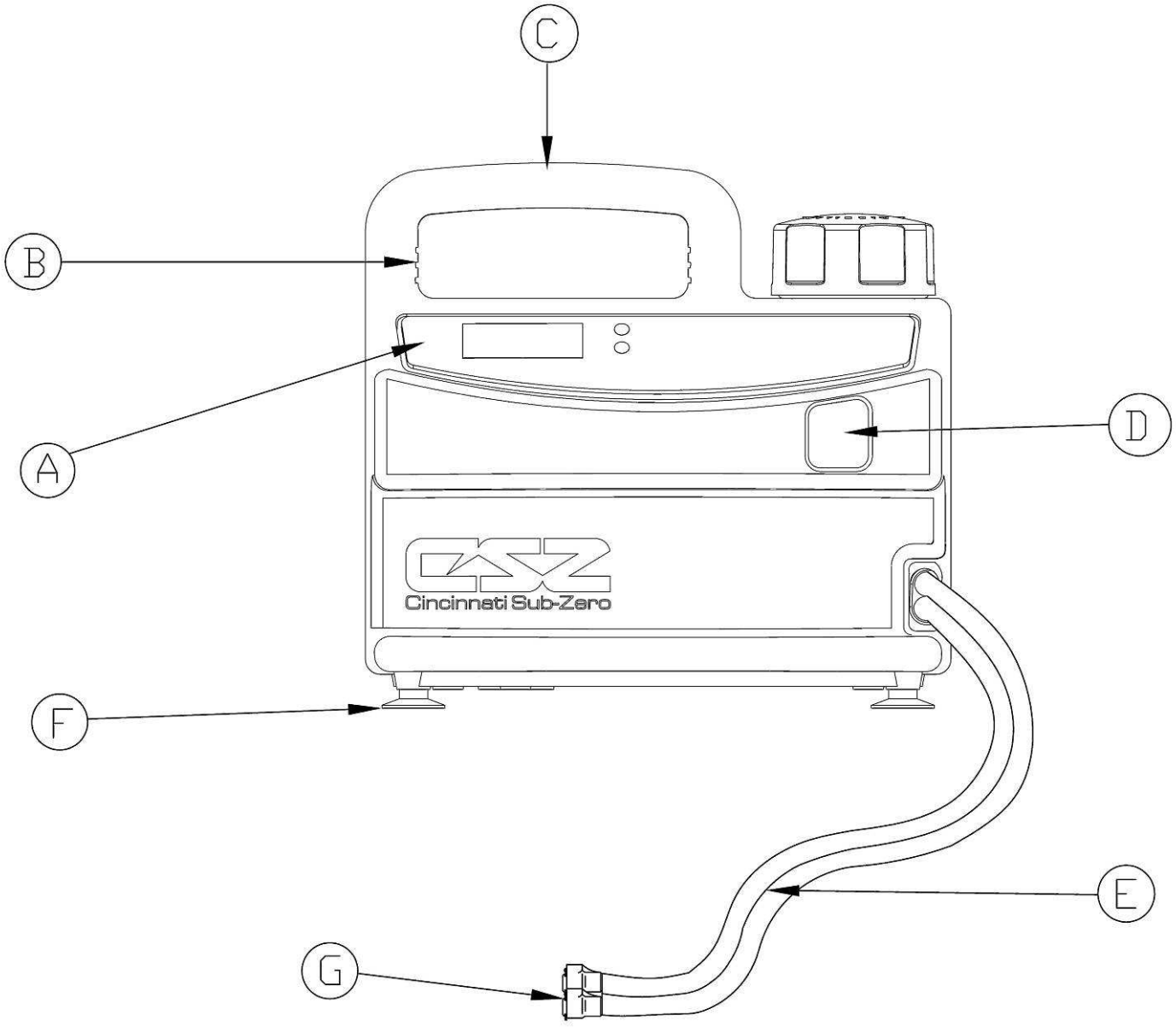

FIGURE 1-1. MICRO-TEMP LT, FRONT VIEW

1-4.2. EXTERNAL FEATURES - REAR VIEW

The external features in Figure (1-2) of the MICRO-TEMP LT unit are described as follows:

A. The power switch is a beveled rocker switch labeled “I” for ON and “O” for OFF.

B. The fuse housing holds replaceable fuses that are integrated in the switch assembly to protect against overload conditions.

C. The main power connection is where the detachable power cord connects.

D. The detachable power cord with a hospital grade plug should only be inserted into a properly grounded receptacle. Electrical specifications are described in Section (7).

E. The water fill opening, secured with a reservoir cap, is where the operator pours distilled water into the unit to fill the reservoir.

F. The specification label outlines the MICRO-TEMP LT unit's electrical requirements and the condensed operating instructions allow the operator to see the instructions and appropriately use the unit.

G. The recessed bottom is used to secure and store the permanently attached hose and/or the power cord by wrapping the hose and/or cord around the unit when it is not in use.

H. The equipment grounding terminal is used to perform the ground continuity test.

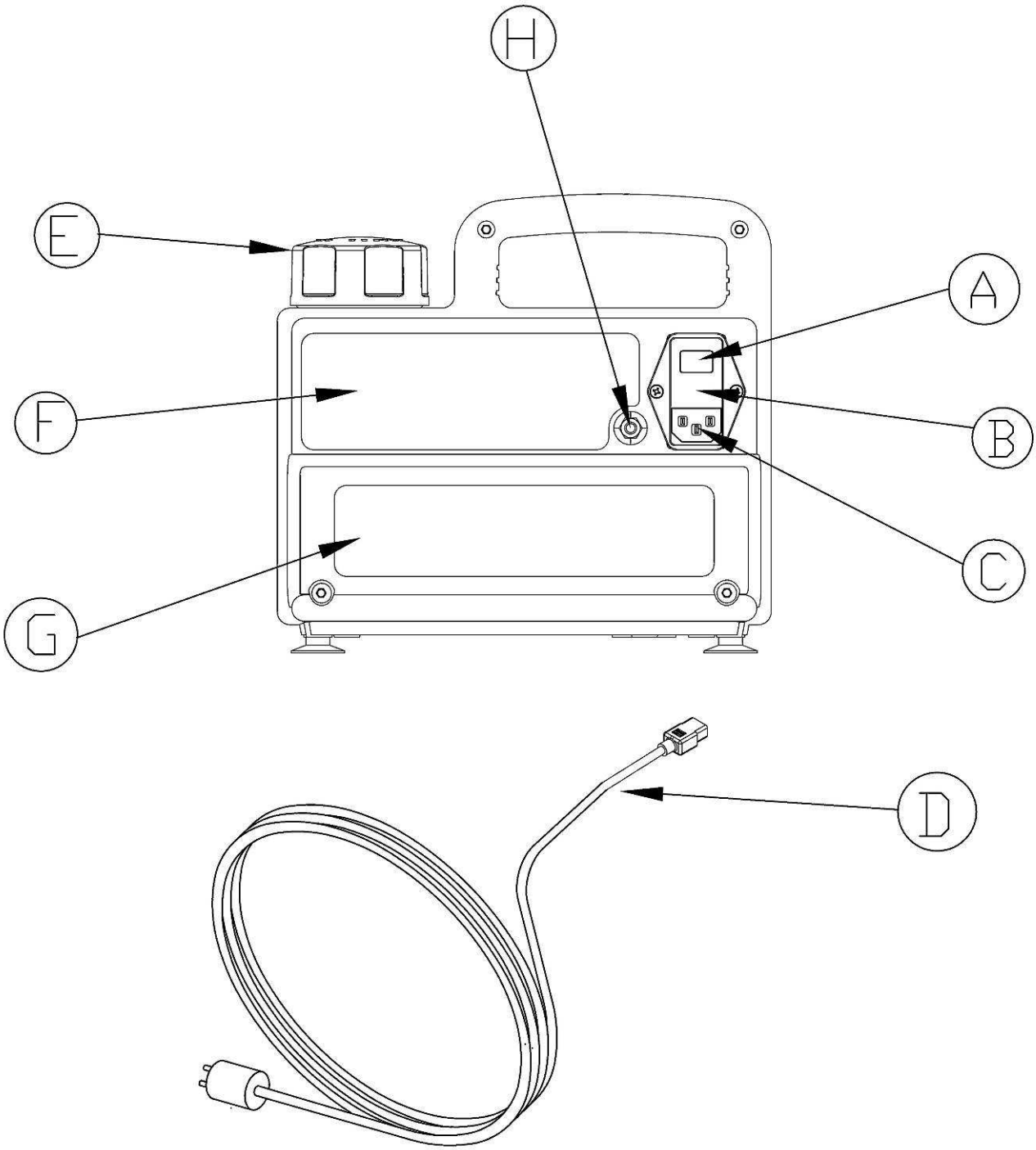

FIGURE 1-2. MICRO-TEMP LT, REAR VIEW

1-4.3. EXTERNAL FEATURES – MEMBRANE CONTROL PANEL

The external features in Figure (1-3) and Figure (1-4) of the MICRO-TEMP LT unit are described as follows:

A. The digital temperature display shows the actual temperature of the circulating water and the set point temperature when the "SET" button is depressed. It also displays alarm messages when a problem occurs, alerting the operator to make a change. Refer to Section (3-5) for a list of possible display messages and alarms.

B. The "Low Water" symbol indicates when the unit is low on water by illuminating the yellow LED to the left of the symbol. Refer to Section (3-5), Step (B) for Low Water Alarm.

C. The "Power Fail" symbol indicates when power has been interrupted by flashing the red LED to the left of the symbol and sounding an audible alarm. Refer to Section (3-5), Step (B) for Power Failure.

D. The "Warning" symbol indicates when the water temperature is >1°C (2°F) over the set point temperature, the water has reached the high limit temperature of 44°C (111°F), the tilt of the unit is beyond approximat ely 20° in any direction, or when there is a fault within the unit by flashing/illuminating the red LED to the left of the symbol and sounding an audible alarm. Refer to Section (3-5), Step (B).

E. The Increment button is used to increase the set point temperature when needed.

F. The "SET" temperature button is used to position the set point temperature.

G. The Decrement button is used to decrease the set point temperature when needed.

H. The "°C" button allows the operator to select Ce lsius as the measurement scale by which the unit functions (100V and 115V only).

I. The "°F" button allows the operator to select Fa hrenheit as the measurement scale by which the unit functions (100V and 115V only).

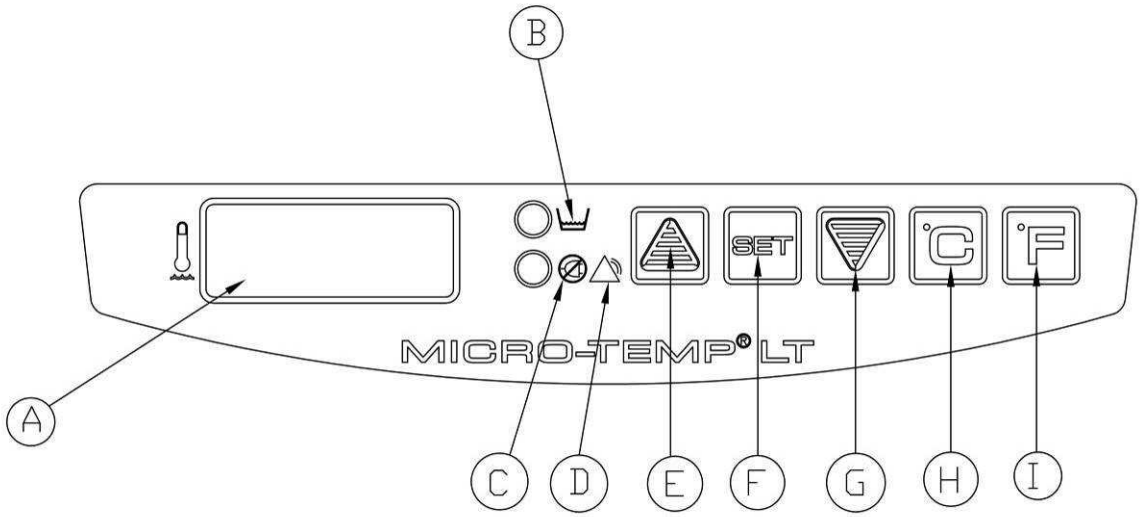

FIGURE 1-3. MICRO-TEMP LT, MEMBRANE CONTROL PANEL (100V/115V ONLY)

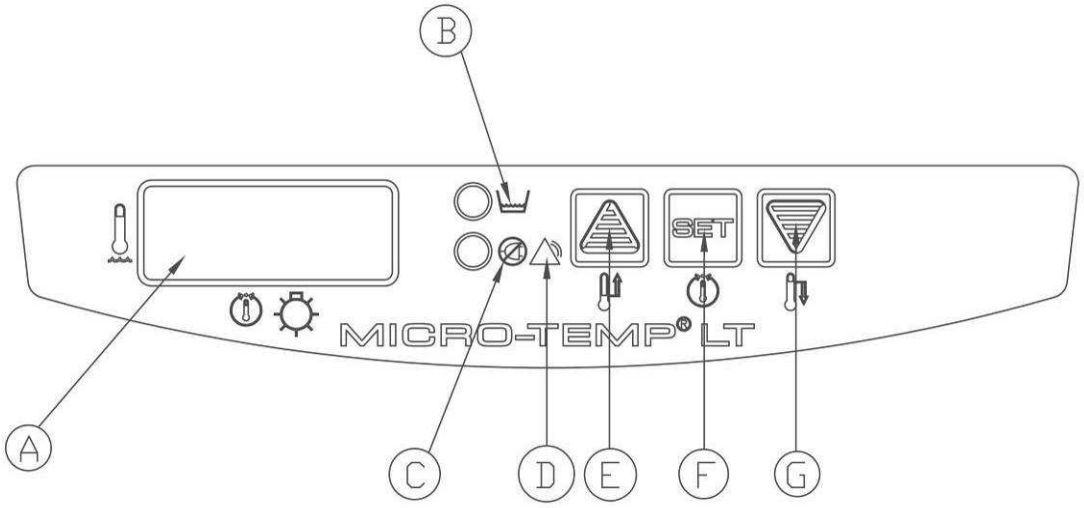

FIGURE 1-4. MICRO-TEMP LT, MEMBRANE CONTROL PANEL (230/240V ONLY)

1-5. REQUIRED ACCESSORIES

The only essential accessory for the MICRO-TEMP LT unit is a thermal pad. Thermal pads are available with or without a layer of foam bonded to one side and with a non-woven fabric on both sides to allow moist heat therapy when the foam or non-woven fabric is wetted. They are available in a variety of sizes. The maximum thermal pad allowed for the MICRO-TEMP LT is 25" x 19".

The thermal pad is connected to the unit via the permanently attached eight foot (2.4 meter) hose with "quick-connect" couplings, featuring automatic shut-offs on the end of each hose.

A list of MICRO-TEMP LT System Equipment and accessories are found in Figure (6-8).

1-6. FUNCTIONAL DESCRIPTION OF THE MICRO-TEMP LT SYSTEM

1-6.1. THEORY OF OPERATION

The MICRO-TEMP LT utilizes a linear temperature controller featuring a digital read-out of water and set point temperature (selectable to indicate Celsius or Fahrenheit for 100V and 115V only), and operates between a temperature range of 20℃ to 42℃ (68℉ to 107℉). In addition, this model includes audible alarms and visual indicators for power failure and warning alarms, along with a visual indicator for low water. Safety features include: linear control to ensure accuracy of temperature setting at all times by eliminating the need for calibration; digital display of actual water temperature as well as set point temperature; a low water cut-off switch which shuts off both the heater and circulating pump; an independent high limit sensor to guard against possible over-heating and subsequent patient injury; and a tilt switch alarm which sounds and shuts the unit off when tilted more than approximately 20° in any direction from the horizontal plane.

1-6.2. HEATING SYSTEM

The MICRO-TEMP LT heating system consists of an immersion heater, a water temperature control, and two high temperature safety devices. Temperature ranges of the system are described in Section (1-6.4). The immersion heater is located in the reservoir. The water circulating in the reservoir flows around the immersion heater and is warmed by conductive heat transfer.

The heating system is operational whenever the control system calls for an increase in the temperature of the circulating water. It is important to note that the rate of change in the circulating water temperature is not directly proportional to the rate of change in the temperature of the patient.

1-6.3. CIRCULATING SYSTEM

The MICRO-TEMP LT circulating water system is composed of a magnetically driven circulating pump, a single self contained reservoir, a connecting hose, quick-disconnect fittings, and a localized heat therapy pad.

The 0.24-gallon (0.9 liters) capacity reservoir is composed of a single circulating unit.

The circulating water flows over and around the heating element and water temperature sensor located in the circulating reservoir. The heated water then flows out of the reservoir, to the circulating pump, through the pump housing and connecting hoses, and then to the localized heat therapy pad. The water circulates through the pad and returns to the unit to be reheated and recycled.

In addition, the reservoir contains a low water level sensor which shuts down the heater and pump, and illuminates the Low Water LED if the water level drops below a preset amount. The unit becomes operational only after the water level is restored to normal.

1-6.4. TEMPERATURE SAFETY CONTROL SYSTEM

The MICRO-TEMP LT unit is designed to carefully measure and control the temperature of the circulating water. It is engineered so that when the temperature of the circulating water reaches the desired set point, the heater cycles in order to maintain the set point temperature. The unit is designed not to exceed or fall below the desired temperature.

As a safety precaution, the MICRO-TEMP LT unit has a >1°C (2°F) over set point alarm and a high temperature alarm.

Each safety device continuously monitors the temperature of the circulating water. As an additional precaution, if the water temperature sensor itself should fail, the unit shuts down and the display indicates EE05. With this safety design, both the patient and the unit are protected from injury or damage caused by extreme temperatures.

NOTE: *The operator must regularly monitor the patient whenever localized heat therapy is used.*

SAFETY CONTROLS FOR PROTECTION FROM HIGH TEMPERATURE

The circulating water reaches 42.0°C ± 0.5°C (107°C ± 1°F), and a microprocessor controls the set point.

If the circulating water reaches 44°C ± 0.5°C (111°F ± 1°F), a safety device shuts off the heater and pump, the display alternates between flashing the actual water temperature and flashing “HL,” an alarm continuously sounds, and the red “Warning” LED illuminates. This alarm condition cancels only after the unit is powered down.

If the circulating water reaches >1°C (2°F) over th e set point, the display flashes the actual water temperature, and 2 beeps sound while the red ”Warning” LED flashes. The safety device shuts off the heater. If the water temperature does not return to the set point temperature after 9 minutes, the device will again sound 2 beeps and the “Warning” LED will flash. The actual water temperature will continue to flash until the water temperature reaches the set point.

SECTION 2. GENERAL PREPARATION OF THE MICRO-TEMP LT SYSTEM

2-1. INTRODUCTION

This section describes the procedures to prepare the MICRO-TEMP LT unit for general use. This entails unpacking the shipment, arranging all the equipment for the first time, and completing a test routine. This section also outlines the bacteriocidal agent preparations, standard safety precautions, and patient preparation/bedside care when using the hyperthermia pad(s). Technical support is available upon request.

2-2. UNPACKING THE SHIPMENT

WARNING

- Do not use if the outer casing or membrane control panel is cracked or internal components are exposed. **Contact with internal components could result in electric shock or thermal injury to the patient or operator.**

During the unpacking process, look carefully for signs of shipping damage. If any unacceptable damage is found, notify the transportation company immediately and file a claim. The transportation company is responsible for the shipment after it leaves the factory. If problems other than shipping damage are found, notify your Cincinnati Sub-Zero representative or the Factory.

2-3. FIRST TIME SET-UP/SYSTEM TEST ROUTINE

This section describes the tasks necessary to inspect and arrange the equipment for the first time after unpacking, and describes a System Test Routine to check the membrane control panel.

The System Test Routine can also be used to teach operators who are unfamiliar with the equipment how to use the unit.

2-3.1. INSPECTING AND ARRANGING THE EQUIPMENT

A. Place the MICRO-TEMP LT unit in an uncluttered work space that is accessible to the correct power source with an ambient temperature between 20°C – 35°C (68°F – 95°F) Position the unit so that the membrane control panel faces the operator. See Section (7) for electrical specifications.

B. Visually inspect the MICRO-TEMP LT unit to determine that there are no missing parts, unusual dents, or punctures.

C. Examine the power cord for cuts or exposed wires and check the power cord for bent or missing prongs.

D. Review Section (1-4.1), (1-4.2), and (1-4.3) to identify the features of the MICRO-TEMP LT unit.

E. Collect and arrange a localized heat therapy pad described in Section (1-5).

CAUTION
• **Use distilled water only. Do Not Use De-Ionized water.**
• **Do not** use alcohol. Alcohol may cause pad deterioration.
• **Do NOT fill the reservoir to the bottom of the strainer if there is water in the pad.** This could cause an overflow when the unit is turned on.

F. Twist off the cap on the water fill opening and gradually pour approximately .9 liters of distilled water and two (2) ounces of Propylene Glycol into the reservoir. Stop pouring when the water reaches the strainer and is visible at the bottom of the water fill opening.

G. Connect the pad to the MICRO-TEMP LT unit by attaching the pad to the couplings at the end of the connecting hose. The pad must be connected to one outlet and one return.

H. Check that the pad is lying flat and that the hose permanently attached to the unit is not twisted or pinched.

I. Check that the power switch of the unit is OFF.

J. Connect the detachable power cord to the unit.

***NOTE**: If pad is placed above unit, disconnect pad prior to turning off unit. This could cause backflow if pad is not disconnected.*

WARNING
• Do not by-pass ground on power cord plug. **Electrical Hazards may result.**

K. Insert the plug into a properly grounded receptacle.

2-3.2. COMPLETING A SYSTEM TEST ROUTINE

After arranging the equipment described in Section (2-3.1), complete the System Test Routine describing which switches to press and the changes to observe.

***NOTE:** If power is supplied to the unit and is removed without actuating the power switch (I/O switch) a power fail alarm is activated. To stop the alarm, restore power to the unit or turn the power switch to the "O" (OFF) position.*

A. Make sure that the power switch is in the "I" (ON) position.

1. The digital temperature display indicates that the unit is on.

a. Upon initial power-up, the unit flashes the 42℃ default set point four times, and then flashes the actual water temperature two times before constantly displaying the water temperature.

2. The pump activates and begins circulating water.

B. Press and hold the "SET" button.

1. The display shows 42℃

C. Release "SET" button.

1. The display reverts back to displaying the actual water temperature.

D. Press the "℉" button (100V and 115V only).

1. The water temperature displayed changes from Celsius to Fahrenheit.

E. Press the "°C" button (100V and 115V only)

1. The water temperature displayed changes from Fahrenheit to Celsius.

NOTE: *If at any time the water falls below a preset limit, the low water sensor is activated and the Low Water LED illuminates. The unit shuts down and the operator cannot proceed until this is corrected.*

If any of the above are not observed, consult the Troubleshooting Guide in Section (5-12). If they are observed, continue with the test routine.

WARNING
• **Water leaks present a risk of infection to the patient** and should be handled accordingly. Proper sanitation procedures should be followed including, but not limited to, the preventative maintenance described in this manual. **Leaky pads or hoses should never be used.**

F. Check the pad for leaks. If a leak is found, the pad cannot be used. The disposal for reusable pads is described in Section (4-4).

G. Check the couplings at the end of the hose and pad for positive connection.

NOTE: *Set point may be displayed in Fahrenheit if the operator is in Fahrenheit mode (100V and 115V only). Otherwise the set point is displayed in Celsius.*

H. While depressing the "SET" button, press the Down arrow next to the "SET" button.

1. The set point display temperature changes and the numbers move down the scale. The longer the button is pressed the faster the digits change. When the button is released and repressed, the digits once again change slowly and then increase in speed. The lowest setting is 20℃ (68℉).

I. While depressing the "SET" button, press the Up arrow next to the "SET" button.

1. The set point display changes and the numbers move up the scale. The longer the button is pressed the faster the digits change. When the button is released and repressed, the digits once again change slowly and then increase in speed. The highest setting is 42°C or 107°F.

NOTE: *If water temperature is >1°C (2°F) over the set point temperature, the display will flash and the unit will alarm.*

J. To complete this test routine, turn the power switch to the "O" (OFF) position.

1. The display goes blank.

K. Disconnect the power cord from the power source and loosely coil it up, securing it with the attached velcro tie.

L. For single-use pads, i.e. TEMP-PAD, MAXI-THERM, and MAXI-THERM LITE pads, follow the instructions packaged with the pad.

The MICRO-TEMP LT unit is now ready for patient use.

2-4. UNIT AND PATIENT RELATED PRECAUTIONS

This unit requires both water and electricity to operate.

Please consult page I, II, and III at the beginning of the manual for a complete list of warnings and cautions related to the MICRO-TEMP LT.

A. Anytime the unit sounds an alarm, the operator should immediately check the status display and act accordingly (e.g., add water, remove from service, etc.). See Section (3-5) for status display and alarm messages.

B. The MICRO-TEMP LT unit is equipped with fuses in the I/O power switch to protect against current overload.

2-5. PATIENT PREPARATION AND BEDSIDE CARE

Effective use of the MICRO-TEMP LT system must include proper patient care prior to and while using the hyperthermia pad(s).

WARNING

- A physician's order is required for setting pad temperature and use of equipment. As directed by physician, check the patient's temperature and skin condition of areas in contact with the pad. Check the pad water temperature. Pediatric patients, temperature-sensitive patients with vascular disease, surgical patients, diabetics, and Raynauds disease patients should be checked more frequently. **Notify the physician promptly of any change in patient status in order to avoid serious injury or death. Failure to inform the physician of any deviation may result in injury to the patient.**

  Pediatrics – Infants and children body temperature are more responsive to surface heating than adults. Due to their size, the effect of heating a child is more pronounced because of their higher ratio of skin contact area to body mass.

  Temperature Sensitive Patients – Patients with impaired peripheral blood circulation and patients who are incapacitated may be more sensitive to temperature changes than patients with normal circulation.

  Surgical Patients – Patients with poor circulation due to inadequate heart function, loss of blood, or impaired peripheral blood circulation may be more sensitive to temperature changes.

- **If device is used at home, patient must follow directions prescribed by their physician** and be aware of all warnings and cautions mentioned throughout the manual.
- **Observe patient's skin condition frequently due to individual differences in sensitivity and susceptibility to injury from heat and/or externally applied chemicals or pressure. Patients at greatest risk are those unconscious, on prolonged therapy, diabetics, children, and persons incapacitated, with sensitive skin areas, or poor circulation.**
- **Do not use for ECMO (Extracorporeal Membrane Oxygenation) therapy.**
- The method of temperature control provided by all localized heat therapy units presents the danger of heating body tissues, particularly the skin, to a point where they are injured, i.e., burns. Depending on the extent and severity of a burn, **very serious complications may arise.**
- Prevent excessive and/or prolonged tissue pressure and shearing forces, especially over bony prominences, to prevent skin damage that may result.
- Do not place additional heat sources between the patient and pad. **Skin damage may result.**
- Do not use the MICRO-TEMP LT system in the presence of flammable anesthetics. **Risk of explosion can result.**
- Do not position unit near any objects that can generate a strong electrical/magnetic field. **Potential electromagnetic interference may result.**
- The display may blank momentarily during an electrostatic discharge event, but the essential performance of the unit is not affected and no harm will occur to the patient. If an electrostatic discharge event occurs, check to see if unit is operating properly. If unit does not return to previous operation, turn unit off then back on and reset temperature settings as prescribed.
- Do not wrap pad so tightly as to constrict blood flow. Do not use pins to secure pad or hoses. Do not allow pad or hoses to come in contact with any sharp object.

WARNING
• Any time water is found leaking into or around the unit, connecting hose, and/or pad, turn the unit off, disconnect the power cord from its power source, and correct the problem before proceeding. **Water leaks could lead to electric shock.**
• **Water leaks present a risk of infection** and should be handled accordingly. Proper sanitation procedures should be followed including, but not limited to, the preventative maintenance described in this manual. **Leaky pads or hoses, as well as unapproved pads should never be used.**
• **Exercise extreme caution if the unit is used for patients who are electrically susceptible** (probe, catheter, or electrodes connected to the heart).
• Keep air vents free of debris and obstruction. **Blockage of the vents could result in the unit overheating which could render the unit unable to provide adequate therapy and excessive surface temperatures could cause injury of patient or operator. Keep unit, specifically the air vents, away from curtains or other obstructions.**
• **Proper sanitation procedures must be practiced and hygienic safety must be maintained to prevent contamination.** Contamination can affect patient's health, i.e. skin irritation/rash may result.
• The repair, calibration, and servicing of the MICRO-TEMP LT should be performed by qualified Medical Equipment Service Technicians, Certified Biomedical Electronics Technicians, or Certified Clinical Engineers familiar with good repair practices for servicing medical devices, and in accordance with instructions contained in this manual. Improper repair can result in system damage and patient injury.

Standard procedures while using a localized heat therapy pad include the following tasks:

A. If used at home, patient **must** follow directions prescribed by their physician and be aware of all warnings and cautions mentioned throughout the manual.

B. Observe skin condition frequently due to individual differences in sensitivity and susceptibility to injury from cold or heat and/or externally applied chemicals or pressure. Patients at greatest risk are those unconscious, on prolonged therapy, diabetics, children, and persons incapacitated, with sensitive skin, or poor circulation.

C. Changes in skin color, edema, inflammation, or indications of pressure, especially over bony prominences, should be noted and treated as ordered. Avoid prolonged tissue pressure and shearing forces over bony prominences.

D. Avoid placing additional heating sources between the patient and the pad.

E. Check pad water temperature frequently to make sure the unit is providing the appropriate therapy.

SECTION 3. OPERATING THE MICRO-TEMP LT UNIT

3-1. INTRODUCTION

This section describes how to operate the MICRO-TEMP LT unit in order to provide maximum therapy to a patient. First, collect the equipment and prepare the patient. Second, set the appropriate controls. For proper knowledge and understanding of the unit, health care facility in-service is available upon request.

3-2. ARRANGING THE SYSTEM COMPONENTS

A. Collect all supplies and equipment

1. MICRO-TEMP LT unit
2. Localized heat therapy pad
3. Distilled water and two (2) ounces of Propylene Glycol

B. Place the MICRO-TEMP LT unit on a secure, flat surface or on a mounting stand within proximity of the patient such that the attached hose will reach the desired therapy site and the unit will still remain accessible to the correct power source. Ambient environment should be between 20℃ – 35℃ (68℉ – 95℉). See Section (7) for electrical specifications.

NOTE: *For optimum use, the unit and the pad should be positioned at the same level.*

C. Review Section (1-4.1), (1-4.2), and (1-4.3), which outlines the features of the unit and membrane control panel.

CAUTION
• **Use distilled water only. Do Not Use De-Ionized water. Failure to use distilled water may result in poor performance and damage to the Micro-Temp LT.**
• **Do not** use alcohol. Alcohol may cause pad deterioration.
• **Do NOT fill the reservoir to the bottom of the strainer if there is water in the pad.** This could cause an overflow when the unit is turned on.
• It is recommended that two (2) ounces of Propylene Glycol be added to the reservoir upon fill up.

D. Check the level of distilled water in the reservoir. To do so, twist off the cap on the water fill opening and check if the water is visibly touching the strainer. If needed, carefully add distilled water. In addition, if the water falls below a preset level, the Low Water LED illuminates and the unit does not operate. The operator cannot proceed until this is corrected as described in Section (4-2.2).

E. Check that the power switch is in the “O” (OFF) position.

F. Inspect the power plug for bent or missing prongs.

G. Connect the detachable power cord to the unit.

WARNING
• Do not by-pass ground on power cord plug. **Electrical Hazards may result.**

H. Insert the plug into a properly grounded receptacle.

I. Lay the localized heat therapy pad flat towards the unit.

J. If the pad is already filled, check that there are no leaks.

WARNING
• **Water leaks present a risk of infection** and should be handled accordingly. Proper sanitation procedures should be followed including, but not limited to, the preventative maintenance described in this manual. **Leaky pads or hoses should never be used.**

K. Connect the pad to the MICRO-TEMP LT unit as described in Section (2-3.1), Step (H).

L. Check that the pad is flat and the connecting hose is not twisted or pinched.

M. Place the pad on the patient's body part.

NOTE: The maximum contact surface temperature is 42℃.

NOTE: *If at anytime, power is removed from the unit without actuating the power switch (ON/OFF switch) a power fail alarm will activate. To stop the alarm, restore power or turn the power switch to the "O" (OFF) position.*

NOTE: *In the case that power is lost and then restored to the unit, the unit will resume the previous operation mode.*

NOTE*: If pad is placed above unit, disconnect pad prior to turning off unit. This could cause backflow if pad is not disconnected.*

3-3. OPERATING THE MICRO-TEMP LT

WARNING
• A physician's order is required for setting pad temperature and use of equipment. As directed by physician, check patient's temperature and skin condition of areas in contact with pad; also, check pad water temperature. Pediatric patients, temperature-sensitive patients with vascular disease, surgical patients, diabetics and Raynauds disease patients should be checked more frequently. **Notify the physician promptly of any change in patient status in order to avoid serious injury or death. Failure to inform the physician of any deviation may result in injury to the patient.**

The MICRO-TEMP LT unit can be set so that it delivers the maximum heating therapy in order to bring the patient's body part temperature to a set point determined by the operator. To do so, set the desired water temperature (in Celsius or Fahrenheit for 100V and 115V only). The MICRO-TEMP LT unit activates to heat and circulate the water. The operator must then regularly monitor the patient wherever localized heat therapy is used.

After arranging the equipment as described in Section (3-2), proceed as follows:

A. Press the power switch to the "I" (ON) position.

1. The digital temperature display indicates that the unit is turned on.

a. Upon initial power-up, unit flashes the 42℃ def ault set point four times, and then flashes the actual water temperature two times before constantly displaying the water temperature.

2. The pump activates and begins circulating water.

3. The water moves from the unit to the pad and returns to the unit.

B. Consult the physician's orders to determine the desired patient temperature. The "SET" temperature can only be set between 20℃ to 4 2℃ (68℉ to 107℉).

C. Use the "℃" or "℉" button (100V and 115V only) to choose the desired temperature scale.

D. Press and hold the "SET" button.

1. The display shows 42℃

E. Release "SET" button.

1. The display reverts back to displaying the actual water temperature.

F. While still depressing the "SET" button, press either the Up arrow or Down arrow to change the SET temperature display to the desired patient temperature. The display can only be set between 20℃ - 42℃ (68℉ – 107℉).

1. The set temperature on the status display changes.

G. When the desired set temperature is displayed, release the Up or Down arrow and the “SET” button.

NOTE: *If water temperature is >1°C (2°F) over the set po int temperature, the display will flash and the unit will sound an alarm.*

H. Check that the water is circulating.

I. Touch the localized heat therapy pad to confirm that the pad is heating.

J. Allow fifteen to twenty minutes for the water to reach selected temperature.

K. To check the set point temperature, press the “SET” button.

L. To make any changes in the control settings, press and hold the “SET” button and begin pressing either the “Up” or “Down” arrow to change the set point temperature.

The MICRO-TEMP LT unit is now operating. Continue to monitor the unit and the patient.

If at any time the display shows a message other than the water or set point temperature, consult the list of display and alarm messages in Section (3-5). If at any time the unit sounds an alarm, make the changes indicated and/or consult the list of alarm messages in Section (3-5).

To turn off the unit or discontinue localized heat therapy treatment, proceed as described in Section (3-4).

3-4. CONCLUDING LOCALIZED HEAT THERAPY TREATMENT

To stop the unit, the operator must turn the power switch to the “O” (OFF) position.

When the localized therapy is concluded and the unit is turned OFF:

A. Disconnect the power cord from the power source and loosely coil it together, securing with the attached velcro strap.

B. Remove the pad.

C. For Single-Patient Use TEMP-PAD, MAXI-THERM and MAXI-THERM LITE pads follow the instructions packaged with the pad.

D. Wrap hose around the bottom recessed area of unit.

3-5. STATUS DISPLAY AND ALARM MESSAGES

The status display reports the water temperature and set point temperature of the unit or indicates changes the operator must make. The status display can show different messages to guide the operator. The following list defines each message and describes the changes, if any, that the operator must make.

A. During normal operation, the status display shows the following message:

Status Display Message	Function
Water Temperature	The water temperature is displayed when the Micro-Temp LT is operating. If the "SET" button is being depressed, the set point temperature is being displayed. In any other case, the actual water temperature inside the reservoir is being displayed. ***Note:*** *If the display temperature is flashing, the water temperature is >1℃ (2℉) from the set point temperature.*

B. The following are alarm/warning messages and/or indicators:

Indication/Warning Message or Indicator	Function
EE05	This message flashes when the water temperature sensor is open or defective. While this message displays, an alarm sounds continuously, the red "Warning" LED illuminates, and the pump and heater shut off. The alarm stops and the unit resets when the unit has been powered down. The unit should not be used again until it is serviced.
EE07	This message flashes when a membrane keypad fault occurs (i.e. the "Set" button is closed at power up). While this message displays, an alarm sounds continuously, the red "Warning" LED illuminates, and the pump and heater shut off. The alarm stops and the unit resets when the unit has been powered down. The unit should not be used again until it is serviced.
EE08	This message flashes when a failure within the microprocessor occurs. While this message displays, an alarm sounds continuously, the red "Warning" LED illuminates, and the pump and heater shut off. The alarm stops and the unit resets when the unit has been powered down. The unit should not be used again until it is serviced.
HL (High Limit Alarm)	This alarm condition occurs when the circulating water temperature has reached the high temperature limit of 44˚C ± 0.5˚C (111˚F ±1˚F). When this occurs, the red "Warning" LED illuminates, an alarm sounds continuously, and the pump and heater shut off. This alarm condition cancels only after the unit has been powered down and the water temperature has cooled below 42˚C. The unit should not be used again until it is serviced.
Power Failure	This alarm condition occurs when a power failure is detected. When this occurs, the red "Power Failure" LED flashes and an audible alarm sounds. This continues until power is restored to the unit, or until the power switch is turned to the "O" (OFF) position. If power is restored to the unit, the unit will resume previous operation.

>1℃ (2˚F) Alarm	This alarm condition occurs when the actual water temperature is 1℃ (2˚F) greater than the set point temperature. W hen this occurs, the display flashes the actual water temperature, an audible alarm sounds 2 beeps while flashing the red ”Warning” LED, and the heater shuts off. If the water temperature does not return to set point after 9 minutes, the 2 beep audible alarm will again sound and the red “Warning” LED will again flash. The actual water temperature will continue to flash until the water temperature returns to the set point. ***Note:*** *Check pad connections if this alarm occurs.*
Low Water Alarm	This alarm condition occurs when the unit is low on water. When this occurs, the yellow “Low Water” LED illuminates and the pump and heater shut off. Once sufficient water level is obtained the unit returns to previous operation.
Tilt Switch Alarm	This alarm condition occurs when the unit has tilted beyond approximately 20˚ in any direction. When this occurs, an alarm sounds, the red “Warning” LED flashes, and the heater and pump shut down. Once the unit returns to an acceptable operating angle, the unit returns to previous operation.

SECTION 4. GENERAL MAINTENANCE OF THE MICRO-TEMP LT SYSTEM

4-1. INTRODUCTION

This section describes the general requirements maintenance personnel should complete on a regular basis so that the MICRO-TEMP LT System continues to operate within the manufacturer's allowable tolerances.

These requirements include changing and replenishing the water in the reservoir, cleaning the exterior of the unit and the localized heat therapy pads, and testing alarm conditions. Figure (4-1) provides a convenient checklist to record the maintenance history of the unit.

The description of each requirement includes the tools, the procedures, and the precautions necessary to complete the requirements. Maintenance, repair and/or service of MICRO-TEMP LT by qualified maintenance/technical personnel **will not** void the warranty of the unit.

WARNING

- **Improper repair and inadequate maintenance can result in damage to the MICRO-TEMP LT system and patient injury.**

The following procedures should be performed quarterly.

- Draining/Replenishing the Reservoir
- Maintenance Checklist
- Exterior Physical Inspection
- Check flow rate
- Check temperature accuracy
- Test Low Water Alarm
- Check Leakage Current
- Test Ground Continuity
- Test high temperature protection
- Test >1℃ (2˚F) Alarm
- Test Power Fail Alarm
- Test Tilt Switch Alarm

4-1.1. TEST EQUIPMENT REQUIRED

The following test equipment is required to perform the preventive maintenance/functional check-out procedures:

- CSZ's model TF100 86173 Dual-Matic (Temperature Tester, Flow Meter)
- Calibrated temperature measuring device
- Digital Safety Analyzer
- Leakage Current Tester

SUGGESTED PREVENTIVE MAINTENANCE CHECKLIST
MICRO-TEMP LT - Model 749

Hospital Control No. _____ Serial Number _____

Check When Completed

1. External cabinet in good condition. (No unusual dents or missing parts) ❑
2. All labels properly affixed. ❑
3. Quick disconnect couplings are tight, straight, and not leaking. ❑
4. Power cord (no cuts or exposed wire) and plug (no bent or missing prongs). ❑
5. Drain and clean reservoir. See Section (4-2). ❑
6. Refill reservoir with distilled/sterile-distilled water. See Section (4-2.2). ❑
7. Condition of pads, hoses, and couplings (check for leaks). ❑
8. Permanently attached connecting hose is tight and not leaking. ❑
9. Leakage current check; all readings should be under 50 microamps. ❑

   See Section (4-5).
   OFF Normal Polarity _____ ON Normal Polarity _____
   OFF Reverse Polarity _____ ON Reverse Polarity _____

10. Ground continuity check; readings should be under 0.2 ohms. Reference Section (4-6). ❑
11. Check flow rate. Should be greater than or equal to 0.30 GPM (115Volt)
    Should be greater than or equal to 0.25 GPM (100/230/240 Volt)
    Reference Section (4-7). ❑
    Actual Flow Rate _____
12. Check >1℃ alarm. Reference Section (4-8). ❑
13. Check temperature accuracy. Reference Section (4-9). ❑
14. Check the high limit safety 44℃ +/- 2℃. Refer ence Section (4-10). ❑
15. Check low water alarm. Reference Section (4-11). ❑
16. Check power fail alarm. Reference Section (4-12). ❑
17. Check tilt switch alarm. Reference Section (4-13). ❑

_____ _____

Signature of Inspector Date of Inspection

FIGURE 4-1. MAINTENANCE CHECKLIST

4-2. MAINTENANCE OF THE WATER RESERVOIR

The reservoir holds approximately 0.24 gallons (0.9 liters) of distilled water that remains in the unit between periods of use. Quarterly, the water reservoir should be drained and replenished.

NOTE: DO NOT USE DE-IONIZED WATER, TAP WATER, OR ALCOHOL.

4-2.1. DRAINING THE RESERVOIR

CAUTION
• Always drain the MICRO-TEMP LT to a sanitary drain because **bio-contaminants** may be present in the unit's water supply.

A. Twist off reservoir cap.

B. Turn unit upside down and pour water into sanitary drain.

C. After all the water has drained from the unit, wipe, clean.

D. If planning on storing the unit, perform the disinfection/dry storage procedure in Section (4-2.3) and store in a dry environment. (Refer to Section (7) specifications for storage conditions)

E. If any other maintenance/repair is to be completed, go to the appropriate section. If not, go to Section (4-2.2) to replenish the reservoir.

4-2.2. REPLENISHING THE RESERVOIR

CAUTION
• **Use distilled water only. Do Not Use De-Ionized water, Tap water, or Alcohol.** Alcohol may cause pad deterioration.
• **Do NOT fill the reservoir to the bottom of the strainer if there is water in the pad.** This could cause an overflow when the unit is turned on.

A. Twist off the reservoir cap and gradually pour approximately 0.9 liters of distilled water (or the distilled water-bacteriostatic preparation described in Section (4-2)) and 2 ounces of Propylene Glycol into the reservoir. (DO NOT USE ALCOHOL, TAP WATER, OR DE-IONIZED WATER)

B. Stop pouring when the water is visible at the bottom of the strainer in the water fill opening.

C. Proceed with normal operations. Always check the water level before starting.

4-2.3. DISINFECTION/DRY STORAGE PROCEDURE FOR CIRCULATING WATER UNITS

Quarterly, at a minimum, the FLUID CIRCUIT DISINFECTION/DRY STORAGE PROCEDURE, listed below, should be conducted.

CAUTION
• For safe handling and use of chemicals follow manufacturer guidelines.
• Always drain the Micro-Temp LT to a sanitary drain because **bio-contaminants** may be present in the unit's water supply.

Chemical Cleaning Circulation Chart

UNIT	MODE	TEMPERATURE	DURATION
Micro-Temp LT	Heating	38℃	5 Minutes

FLUID CIRCUIT DISINFECTION/DRY STORAGE PROCEDURE
for Circulating Water Units Utilizing Household Bleach

The following procedure disinfects the fluid circuit in these products. The required tools/supplies are appropriate drain hose(s) and/or hose connector(s), household bleach, distilled water, U.S.P. Grade Propylene Glycol, and the appropriate AC electrical power

Procedure:

1. Drain the water from the reservoir as described in Section 4-2.1.
2. Turn unit **off ("O" position)**.
3. Fill the reservoir with the appropriate amount of household bleach per the below chart.

UNIT	BLEACH	WATER
MICRO-TEMP LT	27 Milliliters	873 Milliliters

4. Fill the reservoir with warm distilled water.
5. Turn the unit on and circulate per the Chemical Cleaning Circulation Chart (above).
6. Drain the unit as instructed in Step #1.
7. Repeat Steps 3-6 three (3) times.
8. Rinse the unit three (3) times as described in Steps 4-6. Be sure to omit the household bleach (sodium hypochlorite).
9. After the third rinse, drain the unit and fill the reservoir with distilled water and circulate.
10. Check the water with pH strips or other appropriate test method for detecting bleach. If bleach is detected, repeat Steps 4-6.
11. If unit is to be **returned to service**, once no bleach is detected, add the appropriate amount of U.S.P. Grade Propylene Glycol to the water reservoir per the following chart:

UNIT	U.S.P. Grade Propylene Glycol Per Unit
MICRO-TEMP LT	2 ounces (60 cc)

12. Continue to fill the water reservoir with distilled water.
13. If unit is being **placed in dry storage**, continue with procedure.
14. When all fluid has been removed from the unit, disconnect the drain hose(s) and wipe unit clean.
15. Unit is now ready for storage. Refer to Section 7 for specifications for storage conditions.
16. Document unit maintenance.

When you are ready to return unit to service, replenish the reservoir(s) with distilled water. Perform all the checks as described in the respective Manual.

FLUID CIRCUIT DISINFECTION/DRY STORAGE PROCEDURE
for Circulating Water Units Utilizing CE Approved Maranon H (Product of Ecolab)
(Maranon H Is Not Available In the United States)

The following procedure disinfects the fluid circuit in these products. The required tools/supplies are appropriate drain hose(s) and/or hose connector(s), Maranon H, distilled water, and the appropriate AC electrical power.

Procedure:

1. Drain the water from the reservoir as described in Section 4-2.1.
2. Turn unit **off ("O" position)**.
3. Fill the reservoir with the appropriate amount of Maranon H per the below chart.

UNIT	MARANON H	WATER
MICRO-TEMP LT	27 Milliliters	873 Milliliters

4. Fill the reservoir with the appropriate amount of water per the above chart.
5. Turn the unit on and circulate per the Chemical Cleaning Circulation Chart (above).
6. Drain the unit as instructed in Step #1.
7. Repeat Steps 3-6 three (3) times.
8. Rinse the unit three (3) times as described in Steps 4-6. Be sure to omit the Maranon H.
9. After the third rinse, drain the unit and fill the reservoir with distilled water and circulate.
10. Check the water with PH strips or other appropriate test method for Maranon H detection. If Maranon H is detected, repeat Steps 4-6.
11. If unit is to be **returned to service**, replenish reservoir(s) with the appropriate volume of distilled water.
12. If unit is being **placed in dry storage**, continue with procedure.
13. When all fluid has been removed from the unit, disconnect the drain hose(s) and wipe unit clean.
14. Unit is now ready for storage. Refer to Section 7 for specifications for storage conditions.
15. Document unit maintenance.

4-3. MAINTENANCE OF THE MICRO-TEMP LT EXTERIOR – CLEANING INSTRUCTIONS

The MICRO-TEMP LT unit is constructed of a medical grade plastic. For cleaning and disinfecting, always use conventional hospital-approved topical equipment cleaners and disinfectants that do not contain alcohol. Avoid alcohol and other strong, undiluted disinfectants. These may cause staining of the device's outer skin. Thoroughly wipe down device with a damp cloth to remove any residue from cleaning solutions.

4-4. DISPOSAL OF THE LOCALIZED HEAT THERAPY PADS

TEMP-PAD, MAXI-THERM, and MAXI-THERM LITE pads are single patient use pads. Disposal of pads are done in a means consistent with hospital policy protocol for patient contact items.

4-5. CURRENT LEAKAGE TEST

WARNING
• The repair, calibration, and servicing of the MICRO-TEMP LT should be performed by qualified Medical Equipment Service Technicians, Certified Biomedical Electronics Technicians, or Certified Clinical Engineers familiar with good repair practices for servicing medical devices, and in accordance with instructions contained in this manual. **Improper repair can result in system damage and patient injury.**
• Always **unplug the unit** before accessing internal components during service. Failure to unplug the unit could result in **electric shock.**

A. Refer to leakage meter's manufacturing instructions for current leakage test.

B. Turn the Micro-Temp unit ON and check all configurations stated below during the unit self-calibration:

Ground	Polarity
Open Ground	OFF Normal
Open Ground	ON Normal
Open Ground	OFF Reverse
Open Ground	ON Reverse

C. Record results on Maintenance Check List.

4-6. GROUND CONTINUITY TEST

WARNING
• The repair, calibration, and servicing of the MICRO-TEMP LT should be performed by qualified Medical Equipment Service Technicians, Certified Biomedical Electronics Technicians, or Certified Clinical Engineers familiar with good repair practices for servicing medical devices, and in accordance with instructions contained in this manual. **Improper repair can result in system damage and/or patient injury.**
• Always **unplug the unit** before accessing internal components during service. Failure to unplug the unit could result in **electric shock.**

Equipment needed: Multimeter

A. Measure the resistance between the equipment grounding terminal on the back of the unit and the ground pin of the power cord plug.

Note: *The 100 and 115V units have a ground bolt and the 230/240V units have a ground lug.*

B. Resistance should be less than 0.2 Ohm.

4-7. FLOW RATE TEST

WARNING
• The repair, calibration, and servicing of the MICRO-TEMP LT should be performed by qualified Medical Equipment Service Technicians, Certified Biomedical Electronics Technicians, or Certified Clinical Engineers familiar with good repair practices for servicing medical devices, and in accordance with instructions contained in this manual. **Improper repair can result in system damage and/or patient injury.**
• Always **unplug the unit** before accessing internal components during service. Failure to unplug the unit could result in **electric shock.**

A. Attach Dual-Matic to end of 8ft hoses.

B. Turn unit on.

C. Record flow rate. Flow rate must be 0.3 GPM or greater for 115 Volt units. Flow rate must be 0.25 GPM or greater for 100/230/240 Volt units

4-8. >1℃ (2℉) OVER SET POINT CHECK

WARNING
• The repair, calibration, and servicing of the MICRO-TEMP LT should be performed by qualified Medical Equipment Service Technicians, Certified Biomedical Electronics Technicians, or Certified Clinical Engineers familiar with good repair practices for servicing medical devices, and in accordance with instructions contained in this manual. **Improper repair can result in system damage and/or patient injury.**
• Always **unplug the unit** before accessing internal components during service. Failure to unplug the unit could result in **electric shock.**

A. Turn unit on and set for 42°C.

B. Allow water to stabilize at 42°C.

C. Lower the set point value to 40℃.

D. Observe 2 audible beeps while flashing the red “Warning” LED and the display flashing the actual water temperature until the temperature reaches the set point.

4-9. TEMPERATURE ACCURACY CHECK

WARNING
• The repair, calibration, and servicing of the MICRO-TEMP LT should be performed by qualified Medical Equipment Service Technicians, Certified Biomedical Electronics Technicians, or Certified Clinical Engineers familiar with good repair practices for servicing medical devices, and in accordance with instructions contained in this manual. **Improper repair can result in damage to the MICRO-TEMP LT system and patient injury.**
• Always **unplug the unit** before accessing internal components during service. Failure to unplug the unit could result in **electric shock.**

A. Make sure the set point is already set to maximum 42°C (107°F).

B. Attach Dual-Matic to end of eight foot hoses.

C. Insert a calibrated temperature measuring device into the thermometer well of the Dual-Matic.

D. Allow unit to stabilize for 5 minutes after reaching maximum temperature.

E. Take two temperature readings approximately one minute apart. Verify temperatures are within ± 1°C (2°F) of each other.

4-10. HIGH LIMIT SAFETY CHECK

WARNING
• The repair, calibration, and servicing of the MICRO-TEMP LT should be performed by qualified Medical Equipment Service Technicians, Certified Biomedical Electronics Technicians, or Certified Clinical Engineers familiar with good repair practices for servicing medical devices, and in accordance with instructions contained in this manual. **Improper repair can result in damage to the MICRO-TEMP LT system and patient injury.**
• Always **unplug the unit** before accessing internal components during service. Failure to unplug the unit could result in **electric shock.**

A. While depressing the ”Increment”, “Decrement” and “SET” buttons simultaneously, turn unit ON. Continue to press and hold buttons until audible and visual high temp alarm is indicated, then release buttons.

B. Simultaneously press “Increment”, “Decrement” and “SET” buttons again then release and press “SET” button.

Note: Do not touch any other buttons.

C. Unit will heat until it reaches the high limit alarm 44°C ± 0.5°C (111°F ± 1°F).

D. Verify display shows 44°C (111°F). Verify temperature is within allowable range of 44°C ± 0.5°C (111°F ± 1°F). Verify audible and visual alarm and that the pump and heater shut off.

E. Turn unit off and allow the unit to cool down below 40°C before proceeding.

4-11. LOW WATER ALARM CHECK

WARNING
• The repair, calibration, and servicing of the MICRO-TEMP LT should be performed by qualified Medical Equipment Service Technicians, Certified Biomedical Electronics Technicians, or Certified Clinical Engineers familiar with good repair practices for servicing medical devices, and in accordance with instructions contained in this manual. **Improper repair can result in damage to the MICRO-TEMP LT system and patient injury.**
• Always **unplug the unit** before accessing internal components during service. Failure to unplug the unit could result in **electric shock.**

CAUTION
• Always drain the MICRO-TEMP LT to a sanitary drain because **bio-contaminants** may be present in the unit's water supply.

A. Twist off reservoir cap.

B. Turn unit upside down and pour water into sanitary drain until the water level is to the bottom of the sight window.

C. Turn unit ON.

D. Verify "Low Water" indicator illuminates and the pump shuts off.

E. With unit still on, refill reservoir as described in Section (4-2.2) to ensure alarm condition cancels and unit returns to previous operation when sufficient water level obtained.

F. Turn the unit power switch to "O" (OFF).

4-12. POWER FAILURE ALARM CHECK

WARNING
• The repair, calibration, and servicing of the MICRO-TEMP LT should be performed by qualified Medical Equipment Service Technicians, Certified Biomedical Electronics Technicians, or Certified Clinical Engineers familiar with good repair practices for servicing medical devices, and in accordance with instructions contained in this manual. **Improper repair can result in damage to the MICRO-TEMP LT system and patient injury.**
• Always **unplug the unit** before accessing internal components during service. Failure to unplug the unit could result in **electric shock.**

A. Turn unit ON.

B. After unit has been running for a few minutes, disconnect the power cord from the power source.

C. Verify the power failure alarm sounds and the red "Power Failure/Warning" LED illuminates.

D. Turn unit off.

4-13. TILT SWITCH ALARM CHECK

WARNING
• The repair, calibration, and servicing of the MICRO-TEMP LT should be performed by qualified Medical Equipment Service Technicians, Certified Biomedical Electronics Technicians, or Certified Clinical Engineers familiar with good repair practices for servicing medical devices, and in accordance with instructions contained in this manual. **Improper repair can result in damage to the MICRO-TEMP LT system and patient injury.**
• Always **unplug the unit** before accessing internal components during service. Failure to unplug the unit could result in **electric shock.**

A. Tilt unit front, back, and side to side at least 25° from horizontal and hold.

1. Verify that the unit shuts down, the alarm sounds, and the red “Warning” LED illuminates when tilted in each direction.

NOTE: *The alarm will sound after a 5 second delay.*

B. Tilt unit back to acceptable, level position.

1. Verify alarm condition cancels and unit resumes previous operation.

SECTION 5. FIELD REPAIR/SERVICE OF THE MICRO-TEMP LT UNIT

WARNING
• Always **unplug the unit** before accessing internal components during service. Failure to unplug the unit could result in **electric shock.**
• The repair, calibration, and servicing of the MICRO-TEMP LT should be performed by qualified Medical Equipment Service Technicians, Certified Biomedical Electronics Technicians, or Certified Clinical Engineers familiar with good repair practices for servicing medical devices, and in accordance with instructions contained in this manual. **Improper repair can result in system damage and patient injury.**
• **Before** returning the MICRO-TEMP LT to patient use **after** repairs, the MAINTENANCE CHECKLIST in Section 4 must **always** be performed.

Complete the applicable parts of the First Time Set-Up/System Test Routine described in Section (2-3) to determine that the unit is operating.

5-1. INTRODUCTION

This section describes the repair and service tasks that qualified maintenance personnel can complete in the field if a problem should occur. These tasks include servicing any of the following:

1. Membrane Control Panel
2. Heater
3. Control board
4. Display board
5. I/O Power Switch
6. Pump
7. Water Level Sensor
8. Water Temperature Sensor

The description of each task includes the tools, the procedures, and the precautions necessary to complete the task. Maintenance, repair, and/or service of the MICRO-TEMP LT by qualified maintenance/technical personnel **will not** void the warranty of the unit.

The following are required tools necessary for part repair/service:

- #2 Phillips Screw Driver / Cordless Drill with Phillips Tip
- Hex Head Screw Driver
- Flat Head Screw Driver
- Pointed Nose Pliers
- Assorted Nut Driver Set
- Pin Pusher
- 3 mm Hex Key (Allen) Wrench

Figures (5-1), (6-1), (6-3), and (6-5) highlight the interior components of the MICRO-TEMP LT unit. The internal components referenced in Figure (5-1) are as follows:

A. Water Temperature Sensor
B. Heater
C. Water Level Sensor
D. Reservoir
E. Heater Mounting Plate
F. Control Board
G. Display Board

If any part that is removed from the unit is still under warranty, return it to the factory as described in Section (6-4). If it is not under warranty, dispose of the part as required.

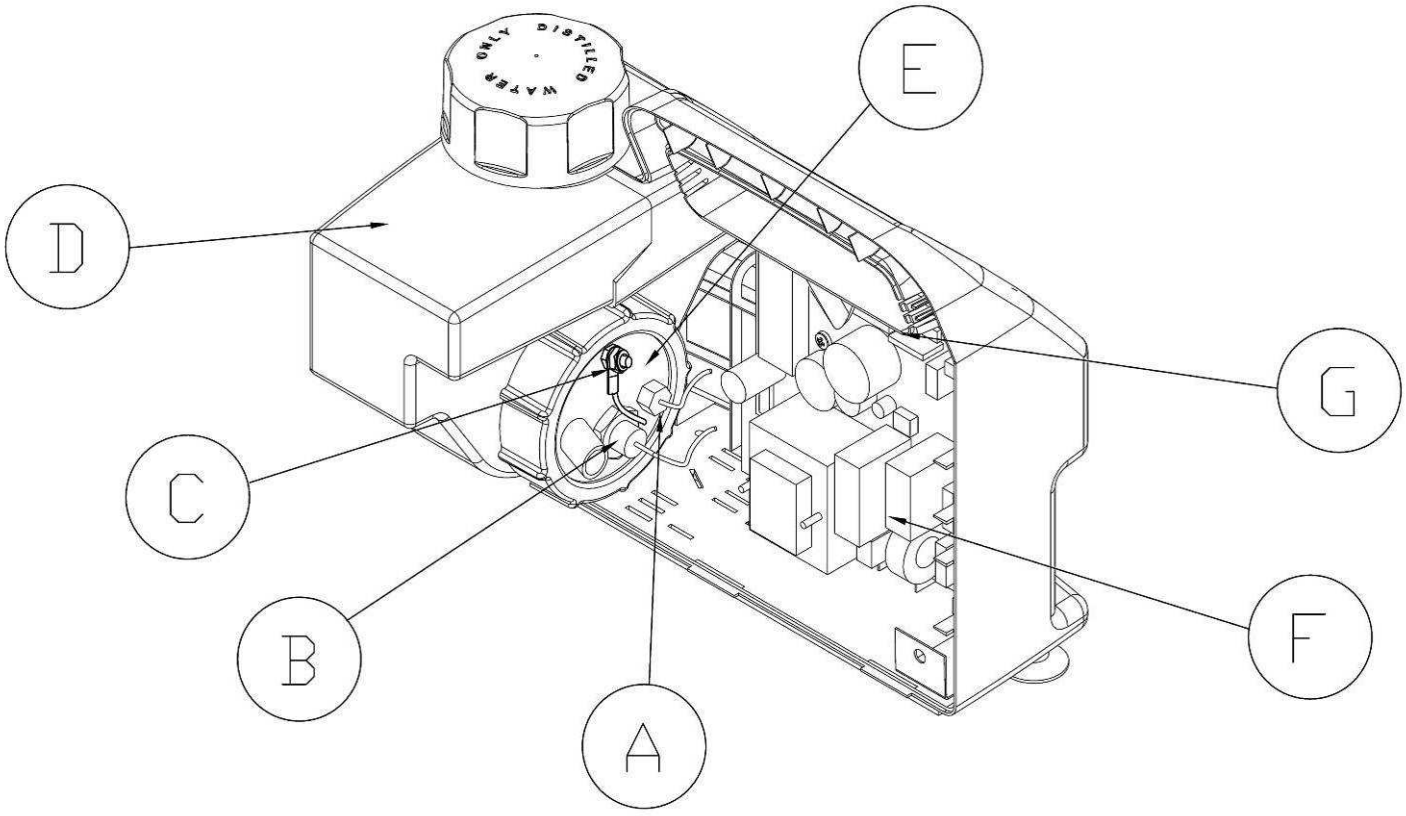

FIGURE 5-1. MICRO-TEMP LT EXPOSED REAR VIEW

5-2. ACCESS TO THE INTERIOR OF THE MICRO-TEMP LT UNIT

All internal operating components are readily accessible by separating the front and rear enclosure.

NOTE: DRAIN THE RESERVOIR AND DISCONNECT THE POWER CORD FROM THE POWER SOURCE BEFORE REMOVING ANY PART FROM THE UNIT.

5-2.1. SEPARATING THE FRONT AND REAR ENCLOSURES

WARNING
• Always **unplug the unit** before accessing internal components during service. Failure to unplug the unit could result in **electric shock.**

A. Using a 3 mm Hex Key (Allen) Wrench, remove the four screws from the back of the unit.

B. Carefully pull the front and rear enclosure apart.

Note: Hose may need to slide through strain relief to provide ample room for maintenance.

5-2.2. RECONNECTING THE FRONT AND REAR ENCLOSURES

WARNING
• Always **unplug the unit** before accessing internal components during service. Failure to unplug the unit could result in **electric shock.**
• ALL ground wires must be connected. Improper grounding may result in **electric shock.**

A. Check all electrical and plumbing connections before reconnecting front and rear enclosure.

B. Slide the front and rear enclosures together.

Note: Make sure no electrical wires are sticking out of the unit.
Note: Make sure the black rubber skirt around the reservoirs water fill opening is resting on top of the front and rear enclosures when they are together.

C. Insert and screw in the four screws with a 3mm Hex Key (Allen) Wrench.

5-2.3. DISCONNECTING THE CABLES FROM THE CONTROL BOARD

WARNING
• Always **unplug the unit** before accessing internal components during service. Failure to unplug the unit could result in **electric shock.**
• Working with electronic boards, plugs, and cables requires delicate handling. Proper **Electrostatic Discharge procedure should be followed during replacement of any electronic board.**

A. Separate the front enclosure from the rear enclosure. Refer to Section (5-2.1).

NOTE: DO NOT BEND ANY OF THE TERMINALS.

B. Locate the following connectors on the control board and disconnect them by pinching the sides to disengage the connector lock, as required:

CONNECTOR	J POSITION
White ribbon cable	J1 position
Blue 7-position membrane ribbon cable connector	J2 position
White 2-position water level connector	J3 position
White 4-position temp sensor connector	J5 position
White 3-position alarm enable connector	J6 position
Red 6-position power connector	J7 position

5-2.4. DISCONNECTING THE CABLES FROM THE DISPLAY BOARD

WARNING
• Always **unplug the unit** before accessing internal components during service. Failure to unplug the unit could result in **electric shock.**
• Working with electronic boards, plugs, and cables requires delicate handling. Proper **Electrostatic Discharge procedure should be followed during replacement of any electronic board.**

A. Remove cables from control board. Refer to Section (5-2.3).

B. Remove the seven 6-32” screws that secure the control board and remove board.

C. Using 7 mm nut driver, remove metal and plastic nuts that secure the display board.

D. Remove ground wire on display board.

E. Pull out display board.

F. Where white ribbon cable attaches to display board, pull out the tabs on the side of the connector.

G. Pull white ribbon cable out of connector.

5-3. REPLACEMENT OF THE HEATER

WARNING
• Always **unplug the unit** before accessing internal components during service. Failure to unplug the unit could result in **electric shock.**

CAUTION
• Always drain the MICRO-TEMP LT to a sanitary drain because **bio-contaminants** may be present in the unit's water supply.

A. Drain the reservoir as described in Section (4-2.1).

B. Separate the front and rear enclosure as described in Section (5-2.1).

C. Using 5/16" nut driver or 5/16" socket, unscrew 6-32" nylon locknut from enclosure bracket and remove all ground wires up to the kepnut on the bracket.

Note: *The kepnut with power switch ground wire and star washer should remain attached to enclosure bracket.*

D. Disconnect the red 6-position connector from the control board (J7 position).

E. Locate the two white wires coming from the heater. Remove white wires from the 6-position connector by using a pin pusher.

F. Loosen hose clamp from the connecting hose that is attached to the reservoir.

G. Remove reservoir from unit.

H. Twist off heater plate cap on reservoir and remove the heater mounting plate.

I. Locate the heater inserted at the center of the heater mounting plate.

J. Remove the nut securing the heater to the heater mounting plate.

K. Remove heater by twisting in counterclockwise direction.

L. Insert and tighten the replacement heater on the heater plate with washer on the inside of the plate. Secure with nut using ¾" slotted socket.

M. Reposition heater mounting plate on reservoir by aligning the tabs with the slots. Twist on heater cap.

N. Insert and lock the 2 white wires from the heater into the 2 open slots on the 6-position connector (position number 3 and 5).

O. Insert and reposition reservoir back into rear enclosure.

P. Tighten hose clamp on the connecting hose between the reservoir outlet and the pump inlet.

Q. Reconnect the red 6-position connector to control board (J7 position).

R. Place the following in the order numbered below on the top of the kepnut on the enclosure bracket:
1. Equipment ground terminal ground wire.
2. Heater ground wire.
3. Display ground wire.
4. Alarm enable ground wire (small green wire).
5. Secure with the 6-32" nylon locknut.

S. Check that all cables are still attached to control board before closing unit.

T. Reconnect front and rear enclosure as described in Section (5-2.2).

U. Refill the reservoir as described in Section (4-2.2).

5-4. REPLACEMENT OF THE PUMP

WARNING
• Always **unplug the unit** before accessing internal components during service. Failure to unplug the unit could result in **electric shock.**

A. Obtain replacement pump.

NOTE: *When replacing the pump, be aware of the inline capacitor.*

CAUTION
• Always drain the MICRO-TEMP LT to a sanitary drain because **bio-contaminants** may be present in the unit's water supply.

B. Drain the reservoir as described in Section (4-2.1).

C. Separate the front and rear enclosure as described in Section (5-2.1).

D. Unscrew hose clamps attached to both the pump inlet and reservoir outlet.

E. Cut wire tie attached to pump outlet.

F. Disconnect elbow from pump outlet.

G. Disconnect white and black pump lead wires.

H. Unscrew all four 8-32" Phillips head pump mounting screws from base.

I. Remove pump (with brackets and connecting hose between pump and reservoir still attached) from enclosure.

J. Remove connecting hose from pump and set aside for later use.

K. Remove brackets from pump by unscrewing 8-32" nylon lock nut on stud of each bracket.

L. Install brackets onto new pump, aligning the edges of the brackets with the edges of the pump mount and tightening both brackets with a nylon lock nut.

M. Slide the connecting hose back onto the inlet of the pump. Be sure hose clamps are loosely on connecting hose.

N. Insert pump into rear enclosure, making sure connecting hose properly aligns with pump and reservoir.

O. Replace the four 8-32" Phillips head screws to the base.

P. Tighten both hose clamps on the connecting hose between the reservoir outlet and the pump inlet.

Q. Reattach elbow to outlet of pump and replace wire tie.

R. Reconnect black and white pump lead wires to appropriate board wires.

S. Check that all cables are still attached to control board before closing unit.

T. Reconnect front and rear enclosure as described in Section (5-2.2).

U. Refill the reservoir as described in Section (4-2.2).

5-5. REPLACEMENT OF THE RESERVOIR

WARNING
• Always **unplug the unit** before accessing internal components during service. Failure to unplug the unit could result in **electric shock.**

A. Obtain a replacement reservoir.

CAUTION
• Always drain the MICRO-TEMP LT to a sanitary drain because **bio-contaminants** may be present in the unit's water supply.

B. Drain the reservoir as described in Section (4-2.1).

C. Separate the front and rear enclosure as described in Section (5-2.1).

D. Loosen hose clamp on the connecting hose that is attached to output hole of heater plate.

E. Carefully remove reservoir from unit.

F. Remove heater plate from reservoir by unscrewing heater cap.

G. Insert heater plate into new reservoir. Be sure to align the tabs on the heater plate with the slots on the reservoir. Secure with heater cap.

H. Remove the black rubber skirt from the reservoirs water fill opening and set aside.

I. Insert new reservoir back into rear enclosure.

J. Reinsert the pump connecting hose to the output hole of the heater plate and tighten hose clamp.

K. Check that all cables are still attached to control board before closing unit.

L. Reconnect front and rear enclosure as described in Section (5-2.2).

M. Place the black rubber skirt that was set aside in Step H, around the new reservoirs water fill opening, just underneath the threads.

N. Refill the reservoir as described in Section (4-2.2).

5-6. REPLACEMENT OF THE TWIN BLACK TUBING

A. Contact CSZ Technical Service.

5-7. REPLACEMENT OF THE WATER TEMPERATURE SENSOR (THERMISTOR)

WARNING
• Always **unplug the unit** before accessing internal components during service. Failure to unplug the unit could result in **electric shock.**

A. Obtain replacement water temperature sensor.

CAUTION

- Always drain the MICRO-TEMP LT to a sanitary drain because **bio-contaminants** may be present in the unit's water supply.

B. Drain the reservoir as described in Section (4-2.1).

C. Separate the front and rear enclosure as described in Section (5-2.1).

D. Loosen hose clamp on connecting hose to output hole of heater plate on reservoir.

E. Disconnect cables from the control board as described in Section (5-2.3).

F. Remove reservoir from unit.

G. Twist off heater cap on reservoir and remove heater mounting plate.

H. Locate the water temperature sensor inserted at the right of the heater on the heater mounting plate.

I. Remove water temperature sensor using 7/16" open-end wrench by turning in counterclockwise direction. Set water temperature sensor aside.

J. Wrap Teflon tape two times around the threading of the new water temperature sensor and place the brass washer onto the water temperature sensor.

K. Insert the replacement water temperature sensor onto the heater mounting plate.

L. Place rubber washer onto water temperature sensor and secure with brass nut.

M. Tighten water temperature sensor until snug using 7/16" open-end wrench.

N. Reposition heater mounting plate on reservoir by aligning the tabs with the slots. Secure by twisting on the heater cap.

O. Reposition reservoir back into rear enclosure.

P. Reinsert the pump connecting hose to the output hole of the heater plate and tighten hose clamp.

Q. Reconnect cables to control board.

R. Check that all cables are still attached to control board before closing unit.

S. Reconnect front and rear enclosure as described in Section (5-2.2).

T. Refill the reservoir as described in Section (4-2.2).

5-8. REPLACEMENT OF THE I/O POWER SWITCH

WARNING
• Always **unplug the unit** before accessing internal components during service. Failure to unplug the unit could result in **electric shock.**
• For continued protection against risk of fire, **replace only with same type and rating of fuse**.

A. Obtain the replacement I/O power switch.

B. Drain reservoir as described in Section (4-2-1).

C. Separate front and rear enclosure. Refer to Section (5-2.2).

D. Using 5/16” nut driver, unscrew the 6-32” nylon locknut from enclosure bracket and remove all ground wires including first kepnut from bracket.

E. Disconnect J6 position connector and J7 position connector from control board.

F. On the red 6-position connector remove the two white heater wires with pin pusher.

G. Unscrew the two kepnuts that secure the power switch on the inside of the rear enclosure with a 7mm nut driver.

H. Remove the power switch and attached cables to the outside of the unit.

I. Using a Flat Head screw driver, open the fuse housing area on the power switch assembly by prying open the cover.

J. Remove the fuse holders and fuses from the power switch assembly.

K. If needed, obtain 2 new fuses for the new power switch assembly. Remove the old fuses and place each of the new fuses inside a respective fuse holder.

L. If new fuses are not needed, keep current fuses in their respective fuse holder.

M. Using a Flat Head screw driver, open the new power tab switch by prying open the cover.

N. Place fuses with fuse holders into the open area in the power switch.

Note: *Make sure arrows on fuse holders correspond with the arrows indicated on the power switch.*

O. Close power switch tab.

P. Insert replacement switch with attached cables into rear enclosure.

Q. Using 7mm nut driver, secure screws with two kepnuts on the inside of the rear enclosure.

R. Reattach two white heater wires to red 6-position connector.

S. Reconnect power switch cables to control board.

T. Place the following in the order numbered below on the top of the kepnut on the pump bracket stud:

1. Star washer.
2. Power switch ground wire.
3. Kepnut.
4. Equipment ground terminal ground wire.
5. Heater ground wire.
6. Display ground wire.
7. Alarm enable ground wire (small green wire).
8. Secure with the 6-32" nylon locknut.

U. Check that all cables are still attached to control board before closing unit.

V. Reconnect front and rear enclosure as described in Section (5-2.2).

W. Refill the reservoir as described in Section (4-2.2).

5-9. REPLACEMENT OF FUSES IN THE I/O POWER SWITCH

WARNING
• Always **unplug the unit** before accessing internal components during service. Failure to unplug the unit could result in **electric shock.**
• For continued protection against risk of fire, **replace only with same type and rating of fuse.**

A. Obtain new fuse/s.

B. Using a Flat Head screw driver, open the fuse housing area on the power switch by prying open the cover.

C. Pull out the fuse holders with fuses from the power switch

D. Remove bad fuse/s from fuse holder/s.

E. Install new fuses inside a respective fuse holder.

F. Re-insert fuses with fuse holders into the open area in the power switch.

Note: *Make sure arrows on fuse holders correspond with the arrows indicated on the power switch.*

G. Close power switch tab.

5-10. REPLACEMENT OF THE WATER LEVEL SENSOR ASSEMBLY

WARNING
• Always **unplug the unit** before accessing internal components during service. Failure to unplug the unit could result in **electric shock.**

A. Obtain a replacement water level sensor.

CAUTION
• Always drain the MICRO-TEMP LT to a sanitary drain because **bio-contaminants** may be present in the unit's water supply.

B. Drain the reservoir as described in Section (4-2.1).

C. Separate the front and rear enclosure as described in Section (5-2.1).

D. Disconnect the 2 pin water level sensor connector (J3 Position) from the control board.

E. Locate the water level sensor inserted above the heater on the heater mounting plate. Refer to Figure (5-1) and Figure (6-5).

F. Remove water level sensor wire from the mounting plate by removing the nylon lock nut using an 11/32" nut driver. Slide out the sensor wire. Set water level sensor aside.

G. Insert and tighten the replacement water level sensor wire in the heater mounting plate by securing with 8-32" nylon lock nut.

H. Reconnect the 2 pin water level sensor connector to the J3 Position on the control board.

I. Check that all cables are still attached to control board before closing unit.

J. Reconnect front and rear enclosure as described in Section (5-2.2).

K. Refill the reservoir as described in Section (4-2.2).

5-11. REPLACEMENT OF THE CONTROL BOARD AND/OR DISPLAY BOARD AND/OR THE MEMBRANE CONTROL PANEL

WARNING
• Always **unplug the unit** before accessing internal components during service. Failure to unplug the unit could result in **electric shock.**
• Working with electronic boards, plugs, and cables requires delicate handling. Proper **Electrostatic Discharge procedure should be followed during replacement of any electronic board.**

REPLACEMENT OF THE CONTROL BOARD

A. Drain the reservoir as described in Section (4-2.1).

B. Separate the front and rear enclosure as described in Section (5-2.1).

C. Disconnect cables from the control board as described in Section (5-2.3).

D. Unscrew the seven 6-32” Phillips head screws that secure the board to the front enclosure.

E. Remove control board and set aside.

F. Install new control board.

G. Secure board to front enclosure with seven 6-32” Phillips head screws.

Note: *Insert the short screw into the hole at the bottom right of the control board (near the J6 Position of the board).*

H. Reattach cables to control board. Refer to Section (5-2.3).

I. Reconnect front and rear enclosure as described in Section (5-2.2).

J. Refill the reservoir as described in Section (4-2.2).

REPLACEMENT OF THE DISPLAY BOARD

A. Drain the reservoir as described in Section (4-2.1).

B. Separate the front and rear enclosure as described in Section (5-2.1).

C. Disconnect cables from control board as described in Section (5-2.3).

D. Unscrew the seven 6-32” Phillips head screws that secure the control board to the front enclosure.

E. Remove control board and set aside.

F. Using 7 mm nut driver, remove plastic nut, nylon locknut, internal tooth washer and ground wire from display board.

G. Pull out display board.

H. Install new display board.

I. Reinstall the left side of the board with internal tooth washer, ground wire, and nylon locknut. Secure right side of board with plastic nut.

J. Reinstall control board.

K. Secure control board to front enclosure with seven 6-32" Phillips head screws.

Note: *Insert the short screw into the hole at the bottom right of the control board (near the J6 Position of the board).*

L. Reattach cables to control board. Refer to Section (5-2.3).

M. Reconnect front and rear enclosure as described in Section (5-2.2).

N. Refill the reservoir as described in Section (4-2.2).

REPLACEMENT OF MEMBRANE PANEL

A. Drain the reservoir as described in Section (4-2.1).

B. Separate the front and rear enclosure as described in Section (5-2.1).

C. Disconnect cables from control board as described in Section (5-2.3)

D. Remove the control board and display board as described above in "Replacement of the display board" Steps D – G.

E. Obtain new membrane control panel.

F. Forcefully pull off old membrane control panel.

NOTE: *Some force may be required due to adhesive.*

G. Remove protective backing from new membrane control panel.

H. Slide ribbon through right hand slot on the front of the front enclosure.

I. Push down on membrane control panel to secure.

J. Reinstall display board.

K. Reinstall the left side of the board with internal tooth washer, ground wire, and nylon locknut. Secure right side of board with plastic nut.

L. Reinstall control board.

M. Secure control board to front enclosure with seven 6-32" Phillips head screws.

Note: *Insert the short screw into the hole at the bottom right of the control board (near the J6 Position of the board).*

N. Reattach cables to control board. Refer to Section (5-2.3).

O. Reconnect front and rear enclosure as described in Section (5-2.2).

P. Refill the reservoir as described in Section (4-2.2).

5-12. TROUBLESHOOTING GUIDE

TROUBLESHOOTING GUIDE		
OBSERVATION	**POSSIBLE PROBLEM**	**ACTION TO BE TAKEN**
A. Unit will not turn on.	Unit not plugged into proper voltage supply.	Plug unit into proper voltage supply. See Section (7) for electrical specifications.
	Blown fuse.	Replace fuse. Refer to Section (5-9).
	Improper connections to control board.	Correct connections to control board. Refer to Section (5-2.3).
B. Unit turns on but will not pump.	Low water.	Add more water to the reservoir.
	Unit tilted.	Place the unit on a level surface.

TROUBLESHOOTING GUIDE		
OBSERVATION	**POSSIBLE PROBLEM**	**ACTION TO BE TAKEN**
	Water level sensor fault.	Turn off unit. Replace/ Repair the water level sensor. Refer to Section (5-9).
	Control board failure.	Turn off unit. Replace Control Board. Refer to Section (5-11).
	High temperature	Check pad connections. Wait a few minutes for water temp to decrease or turn off unit and allow water temperature to cool.
	Improper connections to control board.	Correct connections to control board. Refer to Section (5-2.3).
	Defective pump.	Turn unit off. Replace pump. Refer to Section (5-4).
C. Unit will heat but pump will not run.	Defective pump.	Replace pump. Refer to Section (5-4).
	Improper connections to control board.	Correct connections to control board. Refer to Section (5-2.3).
D. Pump runs but unit will not heat.	Defective heater	Replace the heater. Refer to Section (5-3).
	Temp >1˚C over the set point.	Check pad connections. Wait a few minutes for water temp to decrease.
	Improper connections to control board.	Correct connections to control board. Refer to Section (5-2.3).

TROUBLESHOOTING GUIDE		
OBSERVATION	**POSSIBLE PROBLEM**	**ACTION TO BE TAKEN**
E. Press a button and nothing happens.	Blue ribbon cable disconnected from control board.	Correct connection to the control board. Refer to Section (5-2.3).
	Defective control panel.	Replace control panel. Refer to Section (5-11).
F. Display will not illuminate	White ribbon cable connector between the display board and control board is disconnected or was improperly connected to the display control board or control board.	Correct white ribbon cable connections between control board and/or display board. Refer to Section (5-2.3) and Section (5-2.4).
	Defective control panel and/or display board.	Replace control panel and/or display board. Refer to Section (5-11).
G. Low Water warning light on.	Reservoir water level too low.	Add more water to the reservoir.
	Water level sensor wire has a loose connection to control board.	Properly reconnect the wire to the J3 position of the control board.
	Defective water level sensor.	Replace water level sensor wire. Refer to Section (5-10).
	Lack of conductivity in reservoir.	Add two (2) ounces of Propylene Glycol as instructed on page VII of this manual. This procedure improves conductivity of the water in the reservoir allowing improved low water alarm function.

TROUBLESHOOTING GUIDE		
OBSERVATION	**POSSIBLE PROBLEM**	**ACTION TO BE TAKEN**
H. Audible alarm sounds.	Temperature readout indicates 111˚F / 44˚C or higher.	Unit has reached high limit. Turn unit off and allow unit to cool. Service required.
	Power failure.	Restore power to the unit.
	Unit tilted.	Place the unit on a level surface.
	Temp >1˚C over set point.	Check pad connections. Wait a few minutes for water temp to decrease.
	Water level sensor fault.	Turn OFF unit and make repairs based on the display message. Refer to Section (3-5-B).
I. Red “Warning” light on	Water too hot.	Check pad connections. Wait a few minutes for water temperature to decrease. If the display alternates between flashing “HL” and the actual water temperature, turn unit off, allow unit to cool and then service required.
	Defective control board.	Replace the control board. Refer to Section (5-11.)
	Unit tilted.	Place the unit on a level surface.
	Temp >1˚C over set point.	Check pad connections. Wait a few minutes for water temp to decrease.

TROUBLESHOOTING GUIDE		
OBSERVATION	**POSSIBLE PROBLEM**	**ACTION TO BE TAKEN**
	Water level sensor fault.	Turn OFF unit and make repairs based on the display message. Refer to Section (3-5).
	Power failure.	Restore power to the unit.
J. Ground continuity exceeds 0.2 ohm.	Loose or disconnected ground (green) wire(s).	Tighten or reconnect ground wires.
	Defective connector on ground wire.	Replace defective connector.
	Defective power cord.	Replace power cord.
K. Leakage current exceeds 50 microamperes.	Defective power supply.	Replace power supply. Refer to Section (5-8).
	Defective heater	Replace heater. Refer to Section (5-3).
	Defective pump.	Replace pump. Refer to Section (5-4).

SECTION 6. PARTS INFORMATION

6-1. INTRODUCTION

This section outlines information for ordering, shipping and replacing parts of the MICRO-TEMP LT unit, Model 749. Identification of parts and components are shown in Figures (6-2), (6-4) and (6-6). The numbers in Figures (6-1), (6-3), and (6-5) correspond to the numbers in the accompanying parts list in Figures (6-2), (6-4), and (6-6). Figure (6-7) diagrams the functional operation of the unit and Figure (6-8) lists the MICRO-TEMP LT System equipment and accessories.

6-2. ORDERING INFORMATION FOR REPLACEMENT PARTS

Replacement parts are available directly from CSZ or through our authorized MICRO-TEMP LT dealer. When ordering parts, specify the replacement part number as well as the serial number of your unit located on the specification label on the back of the unit. There is no minimum order requirement for replacement parts. Section (6-3) outlines the recommended replacement parts inventory.

It is strongly recommended that all parts be replaced with parts purchased from CSZ or CSZ International GmbH. Use of other parts could void the warranty on the unit and possibly damage the unit.

6-3. RECOMMENDED REPLACEMENT PARTS INVENTORY

Part Number	Qty.	Description
91090	1	Pump (100V)
91091	1	Pump (115V)
91092	1	Pump (230-240V)
65160	1	Heater (100V)
65161	1	Heater (115V)
65162	1	Heater (230/240V)
41002	1	Thermistor
91162	1 pkg of 5	63 mAmp Fuse for Control Board (230/240V)
91163	1 pkg of 5	GDC-1 Fuse for Power Switch (230/240V)
91164	1 pkg of 5	125mAmp Fuse for Control Board (100/115V)
91165	1 pkg of 5	2 Amp Fuse for Power Switch (100/115V)

6-4. RETURNING PARTS UNDER WARRANTY

All parts are covered by a one year warranty. To replace parts during the warranty period, send the part prepaid to:

Cincinnati Sub-Zero Products, Inc.
12011 Mosteller Road
Cincinnati, Ohio 45241
Tel: (513) 772-8810
Fax: (513) 772-9119

To qualify for credit, warranty parts should be tagged with the following information:

1. The invoice number under which the unit/part was purchased
2. Description of failure
3. Serial number of unit
4. Date of installation or purchase
5. Return Materials Authorization (RMA) number*

* You **must** first obtain a RMA number by calling the factory prior to returning.

6-5. SHIPPING PARTS

Parts to be returned to the factory must be carefully packaged, especially the control board and display board. These boards should be cushioned in static safe packaging material to prevent damage from Electro Static Discharge (ESD).

NOTE: SHIPPING DAMAGE WILL BE THE RESPONSIBILITY OF THE SHIPPER. INSURE IF NECESSARY.

NOTE: IF CONTROL BOARD AND/OR DISPLAY BOARD IS NOT SHIPPED IN STATIC SAFE PACKAGING, WARRANTY WILL BE VOID.

If shipping entire unit, the entire system **must** be drained before shipping.

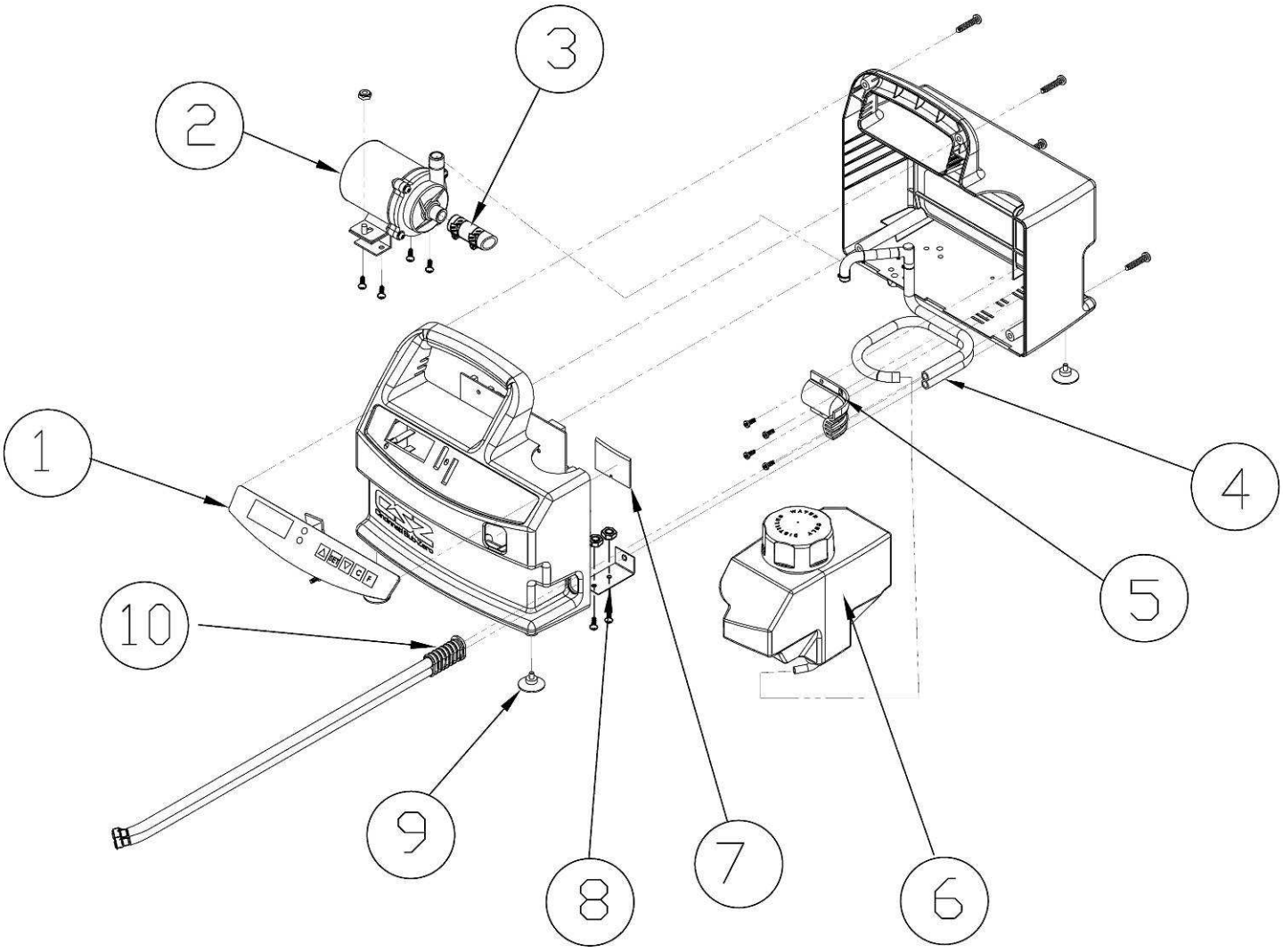

FIGURE 6-1. MICRO-TEMP LT INTERNAL EXPLODED - FRONT VIEW

INDEX NUMBER	I.D. NUMBER	DESCRIPTION
1	78057	Membrane Control Panel LT (100/115V)
	78058	Membrane Control Panel (230/240V)
2	91090	Pump (100V)
	91091	Pump (115V)
	91092	Pump (230/240V)
3	70817	Connecting Hose
4	70238	Twin Black Tubing (0.250 I.D.)
5	62488	Hose Guard
6	62490	Reservoir
7	78080	Sight Window
8	23027	Enclosure Bracket
9	78015	Suction Cup Feet
10	78049	Strain Relief

FIGURE 6-2. PARTS LIST A

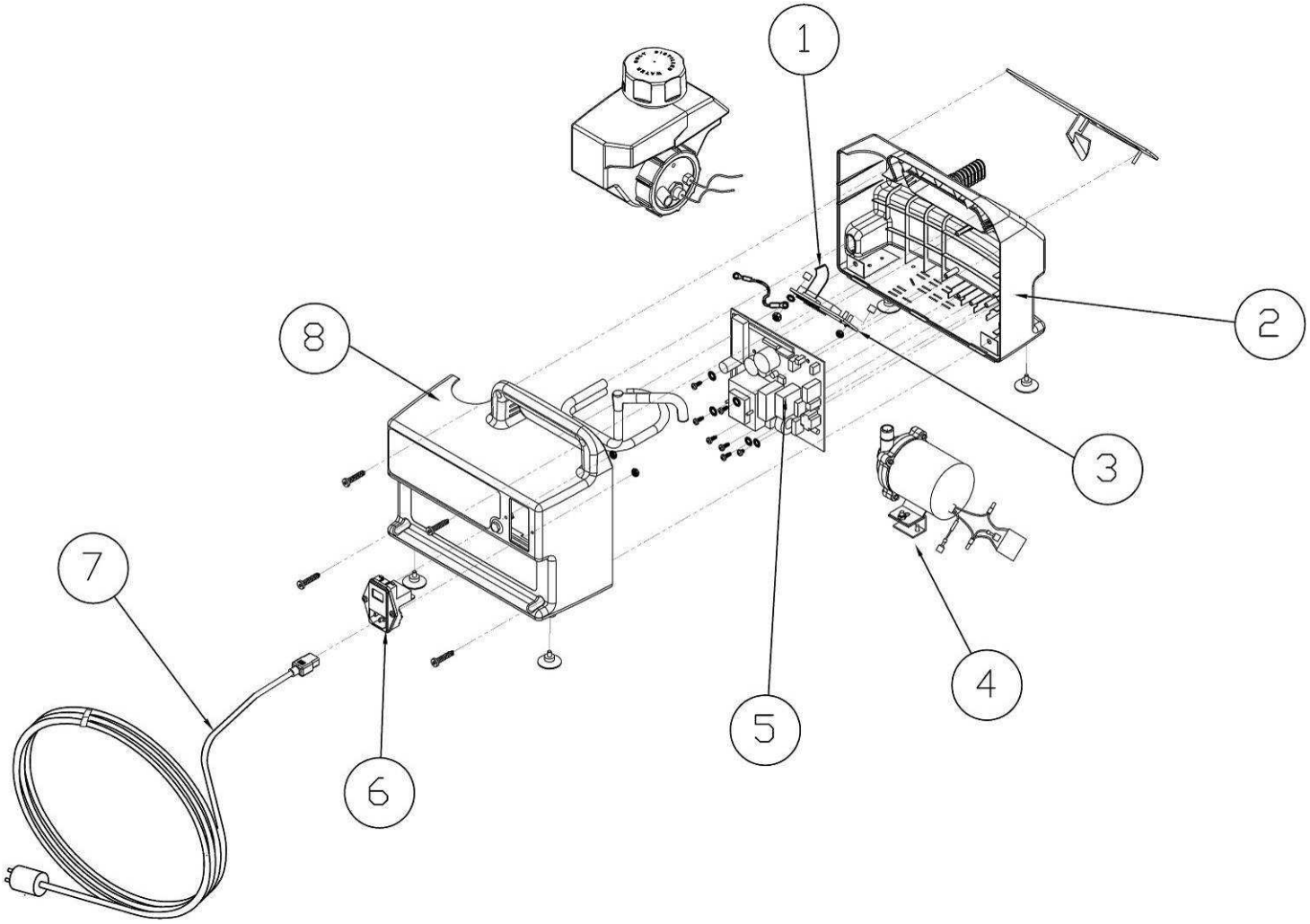

FIGURE 6-3. MICRO-TEMP LT INTERNAL EXPLODED - REAR VIEW

INDEX NUMBER	I.D. NUMBER	DESCRIPTION
1	28352	Display Board Ribbon Cable
2	78043	Front Enclosure
3	78032	Display Board
4	23026	Pump Mounting Bracket
5	78039	Control Board
6	65150	Power Switch
7	37034	Power Cord (100/115V)
	37029	Power Cord (230/240V)
8	78044	Rear Enclosure

FIGURE 6-4. PARTS LIST B

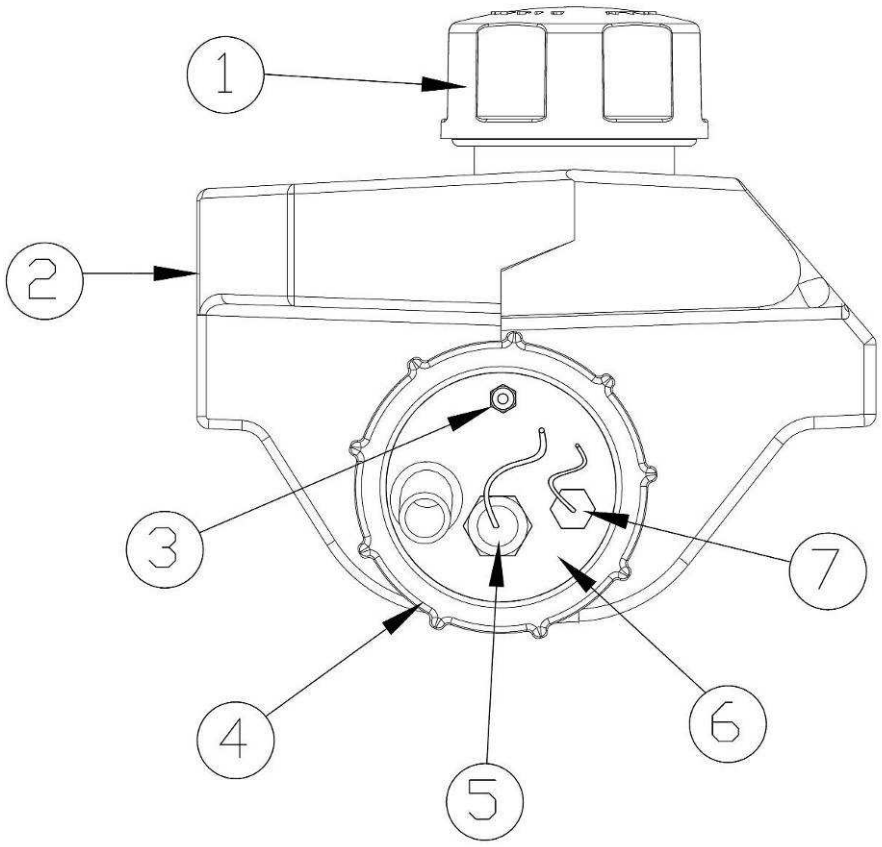

FIGURE 6-5. RESERVOIR – SIDE VIEW

INDEX NUMBER	I.D. NUMBER	DESCRIPTION
1	62491	Reservoir Cap
2	62490	Reservoir
3	65149	Water Level Sensor
4	62492	Heater Plate Cap
5	91090	Heater (100V)
	91091	Heater (115V)
	91092	Heater (230/240V)
6	62494	Heater Mounting Plate
7	41002	Thermistor
Not shown	51118	Black Rubber Reservoir Skirt
Not shown	13100	1/8” NPT Brass Nut
Not shown	60624	7/16” ID Brass Washer
Not shown	60654	7/16” ID Rubber Washer

FIGURE 6-6. PARTS LIST C

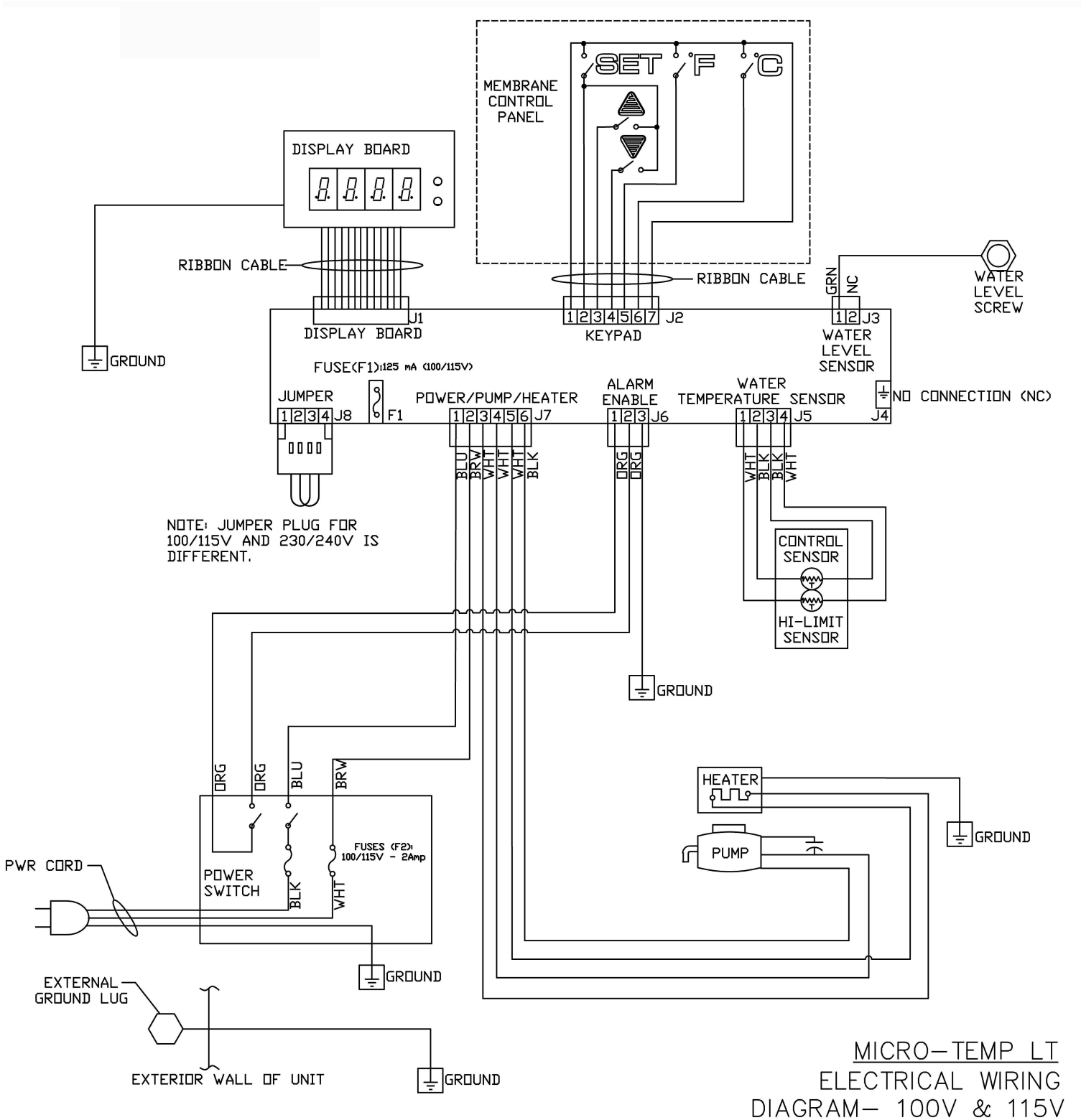

FIGURE 6-7.A. MICRO-TEMP LT ELECTRICAL WIRING DIAGRAM – 100V & 115V

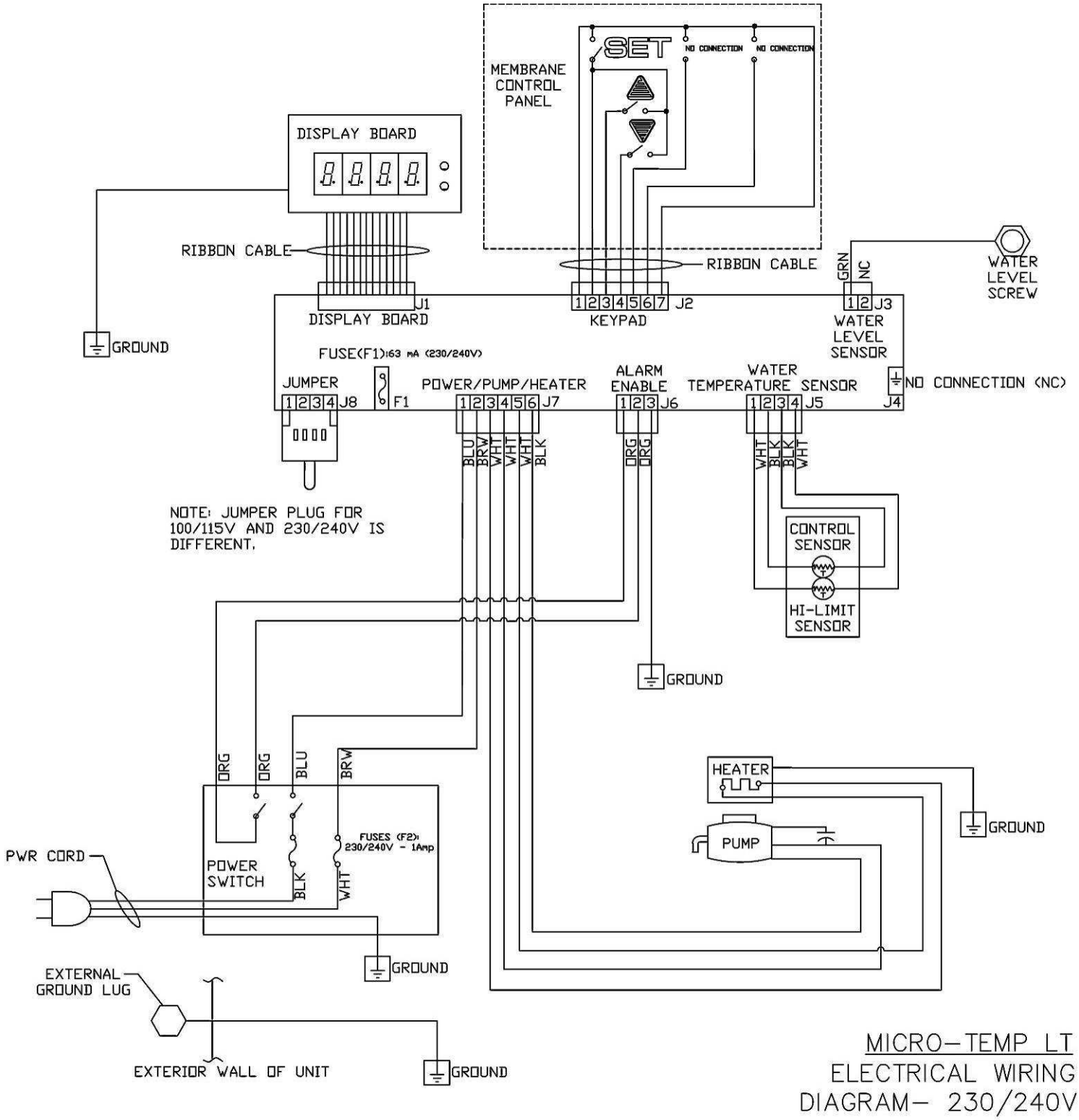

FIGURE 6-7.B. MICRO-TEMP LT ELECTRICAL WIRING DIAGRAM – 230/240V

ACCESSORIES - PADS

MAXI-THERM Single-Patient Use Pads
273 Infant size (12” x 18”)

MAXI-THERM LITE Single-Patient Use Pads
870 Localized Therapy (25” x 4”)
871 Pediatric Size (25”x 16”)
872 Pediatric Size (25” x 19”)
873 Infant Size (12.5” x 18”)

TEMP-PAD Single-Patient Use Pads
1215-VY Vinyl Temp-Pad (12” x 15”)
1215-VF Vinyl/Foam Localized Therapy Temp-Pad (12” x 15”)
1621-VF Vinyl/Foam Localized Therapy Temp-Pad (16” x 21”)
1824-VF Vinyl/Foam Localized Therapy Temp-Pad (18” x 24”)

Other Available Accessories
91506 Floor Stand with Lock
79720 Dual Pad Connecting Hose
79719 Connecting Hose (*CSZ* Thermal Pad to Baxter K-Module)
79724 Quick-Connect Couplings (Adapts Gaymar T-Pump Hose to *CSZ* Thermal Pad)
86173 TF100 Dual-Matic (Temperature Tester, Flow Meter)

FIGURE 6-8. MICRO-TEMP LT SYSTEM ACCESSORIES

SECTION 7. SPECIFICATIONS AND CERTIFICATIONS OF THE MICRO-TEMP LT

MICRO-TEMP LT MODEL 749 FEATURES

CLASSIFICATION

Equipment is Class I.

Equipment is Type B.

PHYSICAL

Dimensions: 9.8"W x 8.2"D x 9.1"H (24.9cm W x 20.8cm D x 23.1cm H)

Weight: 9.0lbs (4.1kg) – empty with power cord attached.

Hose Length: Approx. 8 ft (2.4m.)

Cabinet Construction:
Casing is made of Lexan 923 plastic. Single reservoir. Built-in handle. Bottom air discharge. Four suction cups.

Ambient Temperature (during use):
20℃ ± 0.5℃ (68℉ ± 1℉) to 35℃ ± 0.5℃ (95℉ ± 1℉).

Maximum Contact Surface Temperature:
42℃ (107℉)

SAFETY SYSTEM

Maximum High Control Setting:
42℃ (107℉)

High Limit Safety:
44℃ ± 0.5℃ (111℉ ± 1℉)

Minimum Low Control Setting:
20℃ (68℉)

High Limit Failure Alarm:
Audible & Visual

Low Water Alarm:
Visual

Power Fail Alarm:
Audible & Visual

Tilt Switch Alarm:
Audible & Visual

>1℃ Over Temp Alarm:
Audible & Visual

Water Temperature Sensor Fault Alarm:
Audible & Visual

ELECTRICAL SYSTEM

Electrical Characteristics:
100 V: 90VAC – 110 VAC, 1.7 amp, 50/60 Hz

115 V: 99VAC – 127 VAC, 1.7 amp, 60 Hz

230/240V: 207VAC – 264VAC, 0.85amp, 50/60Hz

Power Cord: Detachable, approx. 10 feet in length, includes a cord strap.
3 conductor, 16/18 AWG
Hospital grade plug

Leakage Current: Under 50 µa

Circuit Breaker: Fuse In Power Switch

THERMAL SYSTEM

Heater: 150 Watts

NOTE: The MICRO-TEMP LT shall take approx. 16 minutes to heat from 20˚C to 42˚C with a 12”x15” Temp Pad attached in ambient conditions.

CIRCULATING SYSTEM

Single Reservoir, 0.24 gallon (0.9 liters) total capacity of distilled water. Permanently attached hose. Error proof, quick-disconnect fittings. Minimum flow rate of 15 GPH (56.8 L/hr).

MICRO-TEMP LT MODEL 749 FEATURES (CONT.)

CONTROL SYSTEM

Microprocessor controlled, Digital LED Read Outs, Alarm Indications

Controller Range:

Water Temp.:	20℃ to 42℃ (68℉ to 107.6℉)

Display Accuracy:

Water Temp.	± 0.5℃ (± 1℉)

Display Range:

Water Temp.:	20℃ - 44℃ (68℉ – 111℉)

Temp. Settings:

Water Temp.:	1℃ (2℉)

ENVIROMENTAL CONDITIONS (during storage and transportation)

Ambient Temperature (transportation and storage):

-40℃ – 65.6℃ (-40℉ – 150℉)

Humidity (transportation and storage):

5% – 95%

WARRANTY

1 yr. parts (Parts and Labor if returned to CSZ)

CERTIFICATIONS

C LASSIFIED UL ® 16HV

MODEL 749 MEDICAL ELECTRICAL EQUIPMENT WITH RESPECT TO ELECTRIC SHOCK, FIRE AND MECHANICAL HAZARDS ONLY IN ACCORDANCE WITH UL60601-1, IEC60601-1, ASTM F2196-02, CAN/CSA-C22.2 No. 601.1 AND IEC60601-1-2.

CE 0344

The following tables are presented in fulfillment of the requirements of IEC 60601-1-2

Guidance and manufacturer's declaration – electromagnetic emissions		
The Micro-Temp LT, Model 749 is intended for use in the electromagnetic environment specified below. The customer or the user of the Micro-Temp LT, Model 749 should assure that it is used in such an environment.		
Emissions tests	**Compliance**	**Electromagnetic environment – guidance**
RF emissions CISPR 11	Group 1	The Micro-Temp LT, Model 749 uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class B	The Micro-Temp LT, Model 749 is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class B	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	

Guidance and manufacturer's declaration – electromagnetic immunity			
The Micro-Temp LT, Model 749 is intended for use in the electromagnetic environment specified below. The customer or the user of the Micro-Temp LT, Model 749 should assure that it is used in such an environment.			
Immunity test	**IEC 60601 test level**	**Compliance level**	**Electromagnetic environment - guidance**
Electrostatic discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air	±6 kV contact ±8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines ±1 kV for input/output lines	±2 kV for power supply lines ±1 kV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	±1 kV differential mode ±2 kV common mode	±1 kV differential mode ±2 kV common mode	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5% U_T (>95% dip in U_T) for 0,5 cycle 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5 s	<5% U_T (>95% dip in U_T) for 0.5 cycle 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5 s	Mains power quality should be that of a typical commercial or hospital environment. If the user of the Micro-Temp LT, Model 749 requires continued operation during power mains interruptions, it is recommended that the Micro-Temp LT, Model 749 be powered from an uninterruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
Note: U_T is the a.c. mains voltage prior to application of the test level.			

Guidance and manufacturer's declaration – electromagnetic immunity

The Micro-Temp LT, Model 749 is intended for use in the electromagnetic environment specified below. The customer or the user of the Micro-Temp LT, Model 749 should assure that it is used in such an environment.

Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment - guidance
			Portable and mobile RF communications equipment should be used no closer to any part of the Micro-Temp LT, Model 749, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. **Recommended separation distance**
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	3 Vrms	$d = 1{,}2\sqrt{P}$
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2,5 GHz	3 V/m	$d = 1{,}2\sqrt{P}$ 80 MHz to 800 MHz $d = 2{,}3\sqrt{P}$ 800 MHz to 2,5 GHz where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,[a] should be less than the compliance level in each frequency range.[b] Interference may occur in the vicinity of equipment marked with the following symbol:

NOTE 1: At 80 MHz and 800 MHz, the higher frequency range applies.

NOTE 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

[a] Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicated theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the Micro-Temp LT, Model 749 is used exceeds the applicable RF compliance level above, the Micro-Temp LT, Model 749 should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the Micro-Temp LT, Model 749.

[b] Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.

Recommended separation distances between portable and mobile RF communications equipment and the Micro-Temp LT, Model 749

The Micro-Temp LT, Model 749 is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the Micro-Temp LT, Model 749 can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the Micro-Temp LT, Model 749 as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter W	**Separation distance according to frequency of transmitter** m		
	150 kHz to 80 MHz $d = 1{,}2\sqrt{P}$	**80 MHz to 800 MHz** $d = 1{,}2\sqrt{P}$	**800 MHz to 2,5 GHz** $d = 2{,}3\sqrt{P}$
0,01	0,12	0,12	0,23
0,1	0,38	0,38	0,73
1	1,2	1,2	2,3
10	3,8	3,8	7,3
100	12	12	23

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

Note 1: At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

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Cincinnati, OH 45241

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